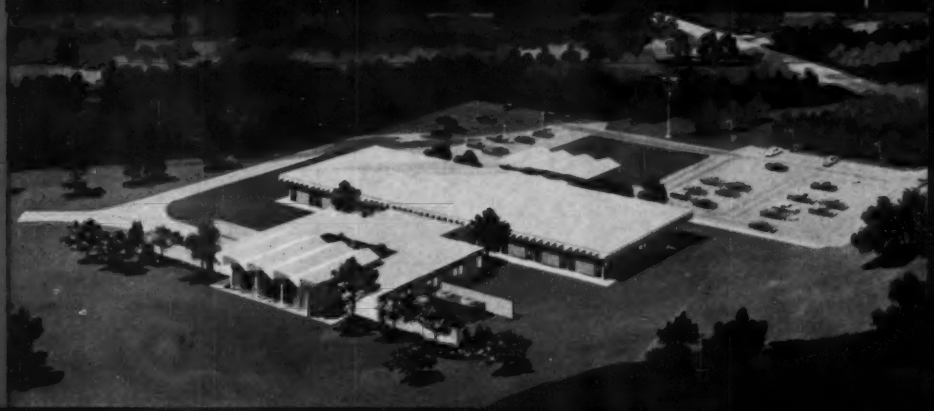
The Electrical Industry's Weekly Magazine March 14, 1960

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Atlantic City Electric Prepares for Automatic Customer Accounting

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PSE&G Uses Old Ferry Boat for Mobile Construction Headquarters

...page 72

Utility Net Incomes Up 9% in '59 ... p 93

ALLIS-CHALMERS

Originators of 5/8% Step Regulators

Hang up the "climbers"!

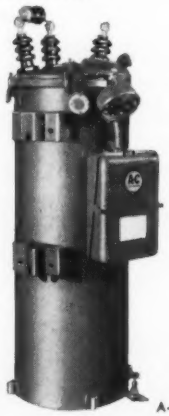
New JFR regulators offer safe, ground-level adjustment

It's standard with Allis-Chalmers! Position indicator drag hands adjust from the ground at the remote control panel. Saves poles, ends risky pole climbing and makes recording of operation range practical. At the push of a button, indicator *drag hands* are reset on large, easy-to-read face with reflecting numbers and indicator hand.

There's much more for you in this all-new design. It's the most advanced regulator on the market today. New sight indicator gives you fast check of oil level. Newly designed cover, with hidden bushing mounting studs, cuts maintenance. JFR's now lower, lighter . . . slashes transportation, handling and installation charges. Ask your nearby A-C office for new JFR bulletin 21B7977E or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Feather-Touch is an Allis-Chalmers trademark.

- External by-pass arrester
- Obstruction-free cover
- Electrical resettable position indicator
- Oil sight gauge
- Feather-Touch control



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Electrical World

Vol. 153, No. 11 MARCH 14, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Utilities Fight Back After Storm Damage

They work to repair damage caused by snow and ice. There were outages in many areas of the nation.....p 62

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J. H. Gantt, South Carolina Electric & Gas Co

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MANAGEMENT

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W. B. Tagen and F. J. Sherman, Boston Edison Co

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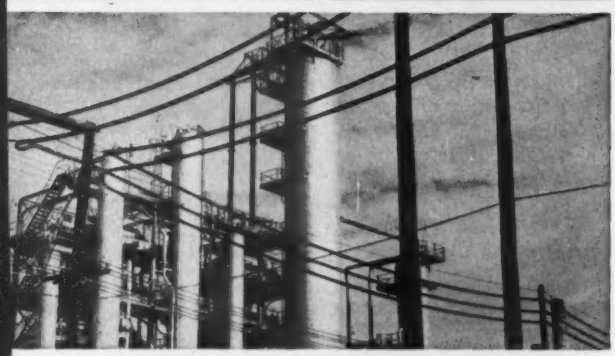
How Okonite solves your High-Voltage Distribution Problem

Reliable primary distribution is a must for efficient, economical operation. As the use of higher voltages increases, the problems of keeping primary distribution reliable increase too. But, whatever your specific need, Okonite has designed a construction that will do the job . . . like those shown here.

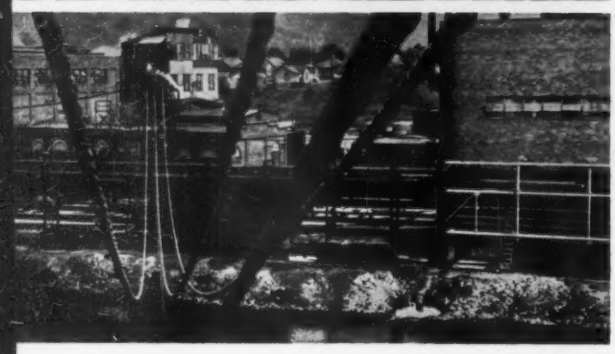
OKOLITE-INSULATED

This Okolite-insulated 25kv submarine power cable, installed by Bonneville Power Administration under Puget Sound, was 7½ miles long, weighed ¾ million lbs. It is typical of the many Okolite-insulated cables designed to solve specific high voltage power problems. Other constructions for underground, aerial, duct or interior installation are frequently protected by an Okoprene (neoprene) sheath, compounded to Okonite's own formula for high weather, temperature and abrasion resistance. Okolite oil-base insulation has demonstrated in more than 30 years of service its high dielectric strength, moisture-resistance and stability in all types of installation conditions. All Okolite-insulated cables must withstand self-imposed a-c and d-c voltage tests that are highest in the industry.



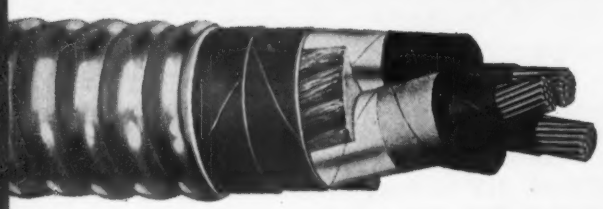
OKONEX-OKOPRENE

This Okonex-Okoprene 15kv primary distribution system was installed to save space, eliminate safety problems and provide improved voltage regulation at Magnolia Petroleum's 1500-acre refinery near Beaumont, Texas. Okonex (butyl-base) cables are highly resistant to heat, and are often specified to give additional protection in high ambient parts of the plant or to provide additional ampacity in circuits. The Okoprene sheath provides excellent protection against moisture and corrosion as in Magnolia Petroleum's refinery where there was a high moisture-saline content in the air plus chemical atmospheres at many of the processing units.



SELF-SUPPORTING CABLE

These four 7500-volt Okolite-Okoprene self-supporting aerial cables span 395 feet to distribute power to a section of a Southern paper mill. Easy to install in one simple operation, Okolite-Okoprene self-supporting aerial cable reduces clearance space requirements, is neat-appearing, often may be installed on existing buildings or supports, offers greater safety to personnel and eliminates insulator flashover due to contamination. Okonite's patented Dualay assembly can be tapped hot at any point in non-shielded types.



LOXARMOR

And on any high-voltage construction, a Loxarmor covering offers economy and flexibility in a cable system where the complete protection of a rigid conduit system is not required. Excellent mechanical protection is provided by a Loxarmor interlocking "S" tape available in galvanized steel, aluminum, bronze or copper. Loxarmor saves money in installation and initial purchase costs, makes it easy to add or re-route circuits and requires less space than conduit to handle the same number of circuits.

One of these high-voltage cable constructions will fill your requirements. Write for Bulletin "How to Choose Insulated Cable," to The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, New Jersey.

***where there's electrical power... there's* OKONITE CABLE**

7080

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LETTERS

Kentucky Bill An Insult

To the Editor:

The bill received in Kentucky's state legislature making utilities legally liable for service interruption except service interruption due to "Act of God" is an insult to any worthwhile utility operating anywhere.

We have had continued uninterrupted service to many consumers for over 20 years and the only interruption of service to anyone is always an "Act of God."

Marvin G. Ott
Board of Public Utilities
Kansas City, Kansas

Public Power Memo Followed

I should like to call to your attention the fact that your editorial on "Politics and Public Power" in the Feb. 1 issue is inaccurate and misleading. The editorial indicates that APPA in its report to the Senate Select Committee on Water Resources first "made the charge" that current estimates of hydro potential are too low and that Bruce Netschert, of Resources for the Future, "agrees with APPA that FPC estimates are on the low side."

The facts are exactly the reverse. Mr. Netschert expressed his views on the subject of hydro potential in testimony before the Joint Economic Committee on Oct. 12, 1959, well before the APPA memorandum was submitted. That Mr. Netschert's conclusions preceded the publication of our memorandum and in fact contributed to our coming to the conclusions that we did, is made crystal clear on page 17 of our memorandum, where there are several references to Mr. Netschert's previous testimony.

Your editorial ignored this obvious fact and conveyed to your readers the idea that a public power group had hatched a plot in which Mr. Netschert and Resources for the Future became willing participants. I can understand why this was done—if it had stuck to the truth, the editorial would not have been half as scary—but I cannot admire such journalistic standards.

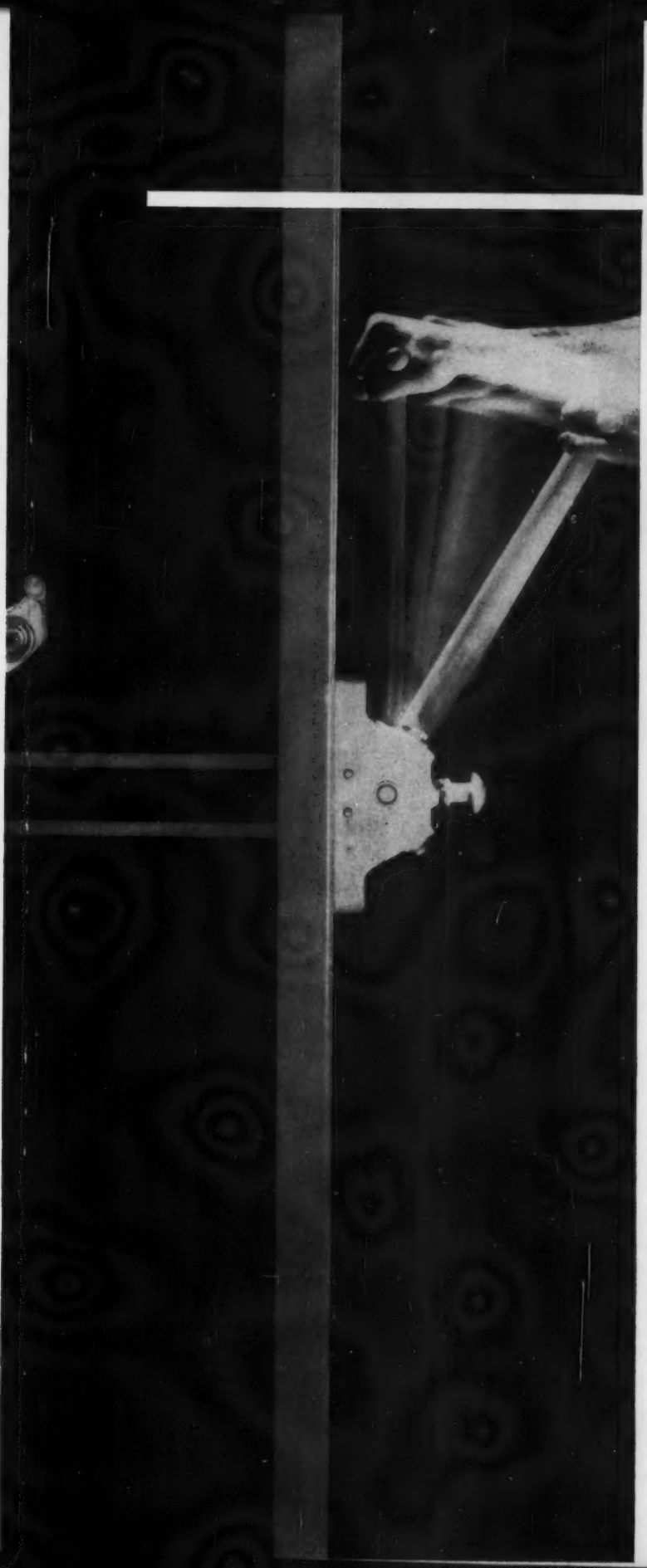
Although I would be pleased to have Resources for the Future ranged on the side of public power, as I respect the abilities of the organization, I seriously doubt that any such alliance is in prospect. In any dealings we have had with Resources for the Future, we have found them to be most scrupulous in maintaining a completely independent position. . .

Alex Radin, General Manager
American Public Power Association
Washington, 6, D. C.

▶Thank you, Reader Radin, for setting this matter right. The error was not deliberate. We just missed the reference in your memorandum.

FAULT CLOSING

S&C metalclad switchgear meets all requirements of new National Electric Code for fault closing, short-circuit interruption. Performance proved by high power testing at KEMA laboratories.



S&C metalclad switchgear can close on any fault up to 60,000 amps

No danger to equipment—no danger to operator even if he closes load interrupter switch on the heaviest faults. S&C's new line of metalclad switchgear is rated as high as 40,000 amps fault closing, 500 mva short-circuit interrupting at 14.4 kv. And at 4.16 kv, the corresponding ratings are 60,000 amps, 250 mva!

Here's how it works: 1) Fault never flows through interrupting unit when switch is closed . . . it flows through separate arcing contacts; 2) Arcing is minimized and magnetic forces are overcome by quick-make, quick-break toggle action no matter how slowly operator closes handle.

Short-circuit interrupting duty (up to 500 mva) is handled by a new boric acid power fuse, the Type SM, which features multiple bore construction to handle low, medium, and high faults.

The simplicity of the S&C design—power fuses for short-circuit interruption and load interrupters for manual or automatic load switching—enables you to save as much as 50 percent on your switchgear investment. Why not consider S&C Metalclad Switchgear for your high voltage power systems? In industrial plants and commercial and institutional buildings there are rarely any transient faults, so there is no real need for the automatic reclosing ability of the more expensive circuit breaker type of switchgear.

For more information please consult the telephone directory for your nearest S&C sales office.

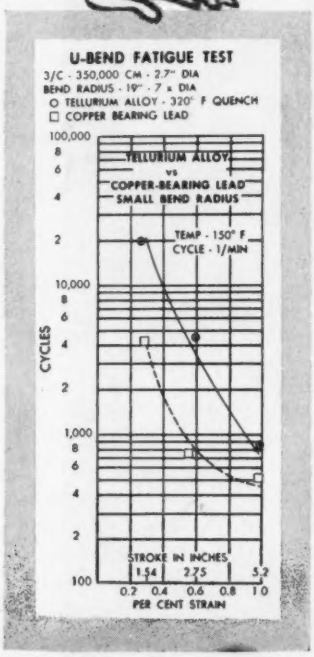
S & C ELECTRIC COMPANY

4421 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1910

S&C

ROEBLING'S TELLURIUM LEAD ALLOY SHEATH LASTS 4½ TIMES AS LONG!



It's been proved in laboratory tests—the Tellurium Lead Alloy Sheath on Roebling Paper Power Cable has *4½ times more bending life* than copper bearing lead sheath! What's more, tests (and experience) prove this sheath has outstanding stability under heat... unusual resistance to age hardening... negligible creep rate at 200 psi, 150°F.

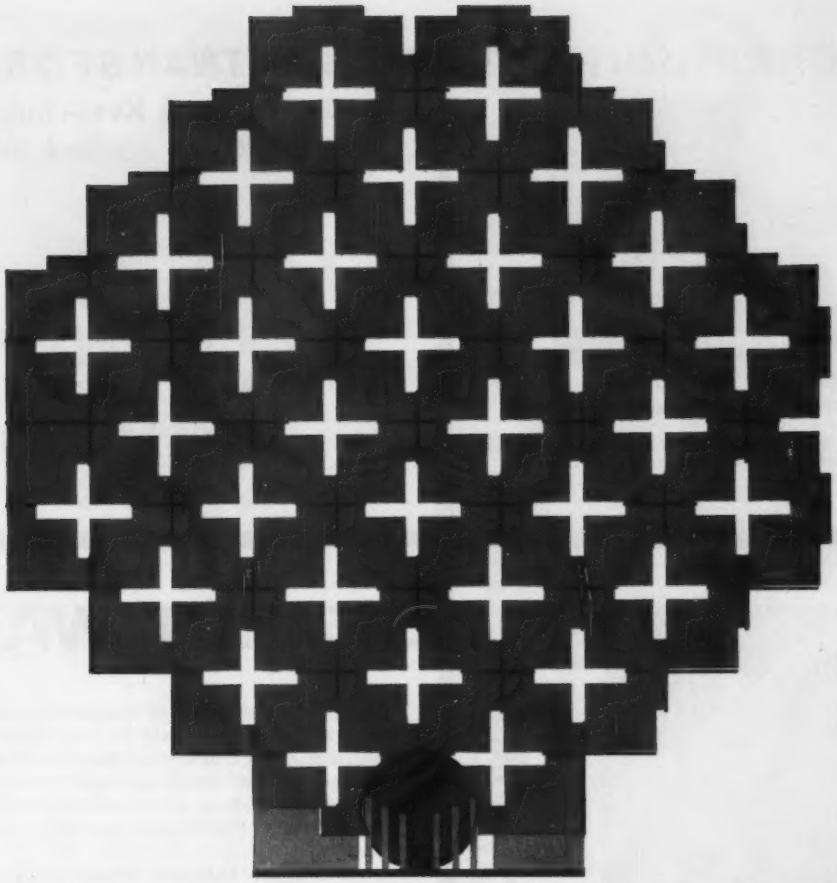
The paper power cable inside matches the extra quality of the sheath. And that's the whole story—there's simply no better cable buy, when the cable you use has to last, then last some more!

Test data and an informative folder about the exceptional properties of this sheath are available. Write: Electrical Wire, John A. Roebling's Sons Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices In Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

Roebling electrical wires and cables are available with either copper or aluminum conductors.



YANKEE ATOMIC ELECTRIC POWER STATION

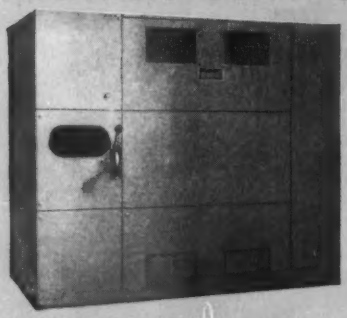
USING 1,750,000 MALLINCKRODT URANIUM UO_2 FUEL PELLETS

This reactor, as well as those of Commonwealth Edison Company and Consolidated Edison Company, depends upon commercially produced nuclear fuels. The uranium loading of all three will be entirely or in part Mallinckrodt processed UO_2. ◆ As the roster of reactor projects grows . . . so does the number of Mallinckrodt nuclear customers. Whether power, propulsion or experimental—domestic or overseas—Mallinckrodt has unequaled experience in producing nuclear fuel materials. ◆ Mallinckrodt's new automated pellet plant is producing about half of the UO_2 pellets (3.4% enriched) for the 134,000-kilowatt reactor of Yankee Atomic Electric Company. ◆ Mallinckrodt now offers more than 15 forms of uranium compounds and metal . . . and can deliver completed fuel elements by working with metal fabricators. ◆ For consultation on nuclear fuel problems, write or call Mallinckrodt.

MALLINCKRODT NUCLEAR CORPORATION · ST. LOUIS 7, MO.
THE WORLD'S FIRST AND LEADING PRODUCER OF NUCLEAR FUELS

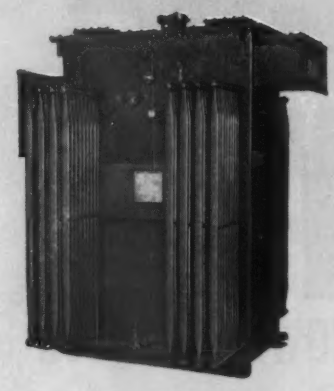
WAGNER UNIT SUBSTATION TRANSFORMERS

112½ to 2000 Kva—three phase, 60 cycles, 15 KV and below



VENTILATED DRY-TYPE—For indoor installation in reasonably dry, dust-free, well ventilated locations. Light in weight, ideal for multi-story buildings. No fireproof vaults required. Insulated for 80°C temperature rise.

for your plant's electrical system...



OIL-FILLED—Generally installed outdoors. Can be used indoors in fireproof vaults. Outdoor transformers can be connected to indoor switchgear using weather-proof bus-duct. 55°C rise, self-cooled or forced-air cooled.

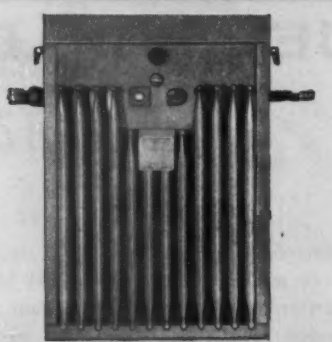
SELECT WAGNER

There's a complete line of Wagner Industrial Transformers. One or more of them will fit your specific needs whether you're planning a new plant distribution system, modernizing your present one, or adding to its capacity to meet increasing demands for power. So, select and specify Wagner Transformers. They'll give you long, dependable service because:

All Wagner Industrial Transformers are liberally designed, sturdily constructed, thoroughly tested, and able to meet the heaviest industrial demands. You get continuous, dependable power for years.

For your main plant substation, Wagner Liquid-Filled Industrial Power Transformers are available in standardized ratings through 10,000 Kva.

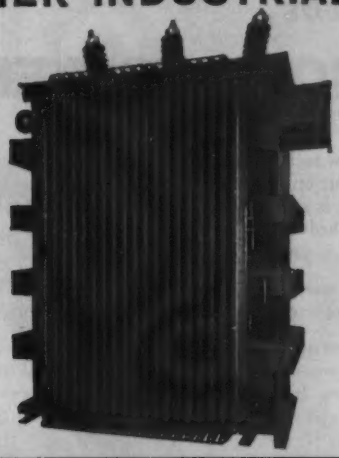
Load centers? Wagner makes PREDESIGNED Unit Sub-



NOFLAMOL—Non-inflammable liquid-filled. For indoor or outdoor installation, especially suited for chemical plants, refineries and similar locations where explosive liquids or gases are present. The close-coupled design fits flush against switchgear enclosures to save space. Throat connected designs are also available. 55°C rise, self-cooled or forced-air cooled.

SEALED DRY-TYPE—Hermetically sealed in welded steel cases to provide positive protection from contamination, fire and explosion hazards. Sealed tank is filled with inert nitrogen. Only maintenance needed is periodic checking of gas pressure. Can be safely installed in any load center.

WAGNER INDUSTRIAL POWER TRANSFORMERS



Oil-filled, for outdoor installations, available through 10,000 Kva, 67 KV and below.

Noflamol, non-inflammable liquid-filled for explosive atmospheres, available through 7,500 Kva, 15 KV and below.

The performance stability of Wagner Industrial Power Transformers is outstanding. Quality is designed and built into these transformers by specialists with years of transformer engineering and production experience. Highest quality materials... carefully controlled production methods... constant inspections and tests make sure these transformers give in-service performance that means better service for your system.

INDUSTRIAL TRANSFORMERS

station Transformers to meet your particular requirements. Furnished with suitable incoming line sections, these transformers will save you time and job engineering costs. And, you can specify the secondary switchgear you prefer.

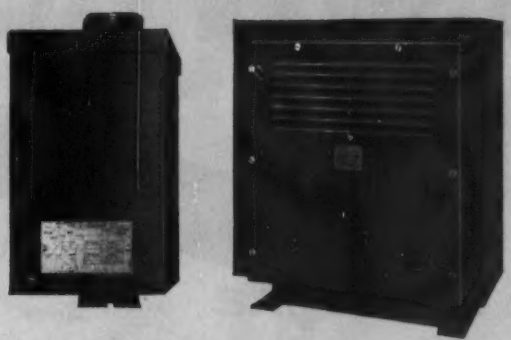
Wagner Dry-Type Distribution Transformers are an economical choice for plant areas requiring 120/240 volts, single-phase or 208Y/120 volts three-phase.

Over 65 years of constant research and development has made Wagner a leader in transformer design . . . made the name Wagner one of the foremost in power planning. For expert advice on your present and future plant transformer needs, call or write the Wagner branch near you.

get economical, dependable, power packages!

Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 33, MO., U. S. A.

WAGNER DRY-TYPE DISTRIBUTION TRANSFORMERS



Single-phase 1 to 100 Kva—Three-phase 3 to 300 Kva—600 volts and below.

These dry-type distribution transformers have a low sound level, are compact and light in weight. They meet all safety requirements for indoor installation. They are economical to maintain... have no liquids, valves, gaskets or gauges.

Type AE, single-phase, 1 through 50 Kva, and Type AP, three-phase, 3 through 30 Kva, can be installed indoors or out. Larger ratings for indoor installations only. Ratings through 10 Kva single-phase are filled with an epoxy compound... operate quiet as a whisper... perfect for areas where noise would be a nuisance. They, and three-phase units through 30 Kva are designed for wall mounting... other ratings for floor or platform mountings.

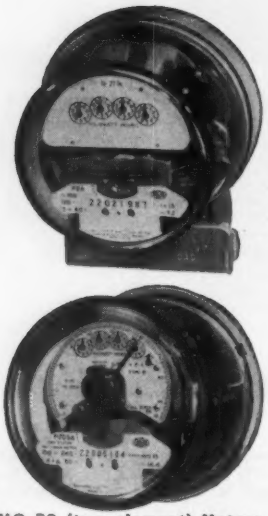
Available for high voltages of 120 x 240, 240 x 480, 480 and 600 volts to 120/240 volts single-phase, and 480 and 600 volts to 208Y/120 volts three-phase.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

WT60-5

DEVELOPED TO MEET YOUR NEEDS...

ACCELERATED



SANGAMO P2 (two element) Meters accurately measure loads from 18 to 96,000 watts. They give sustained accuracy because of Sangamo's precise factory calibration... skillful design...careful selection of materials...rigid manufacturing control. Slow disk speed, reduced current and potential damping provide greater inherent accuracy in P2 meters.

Now, through new techniques, Sangamo polyphase meters are shipped only five days after your order is received at our Springfield plant. This fast, pacesetter service is made possible through a new order entry system, a new manufacturing scheduling system—using our IBM computer—and new shipping techniques and facilities.

Meters flow from assembly and test lines *to you* without delay. The new million dollar factory warehousing-shipping operation backs up local meter stocks.

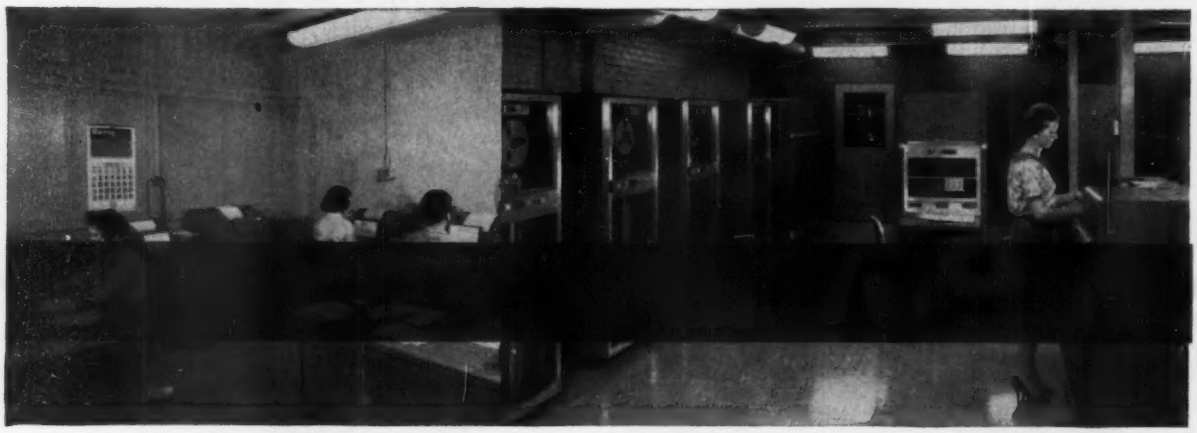
Consider this: Five day service on P2 and P3 meters (with demand registers too!) means that you can reduce inventories, and still have the meters *when you need them.* It means you can utilize your crews more effectively, reduce handling, and save storage space. In short, you can cut costs all along the line.

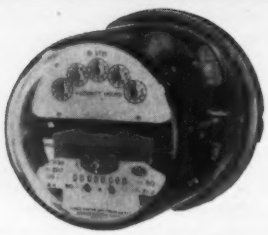
Want to be convinced that our delivery is really fast? Just keep tabs on your next order of Sangamo polyphase meters—the quick delivery time is your proof.

Want to be convinced of the excellence of P2 and P3 meters? Order some and test them. We are sure you will be pleased.

RAPID DELIVERYMAN...SANGAMO STYLE

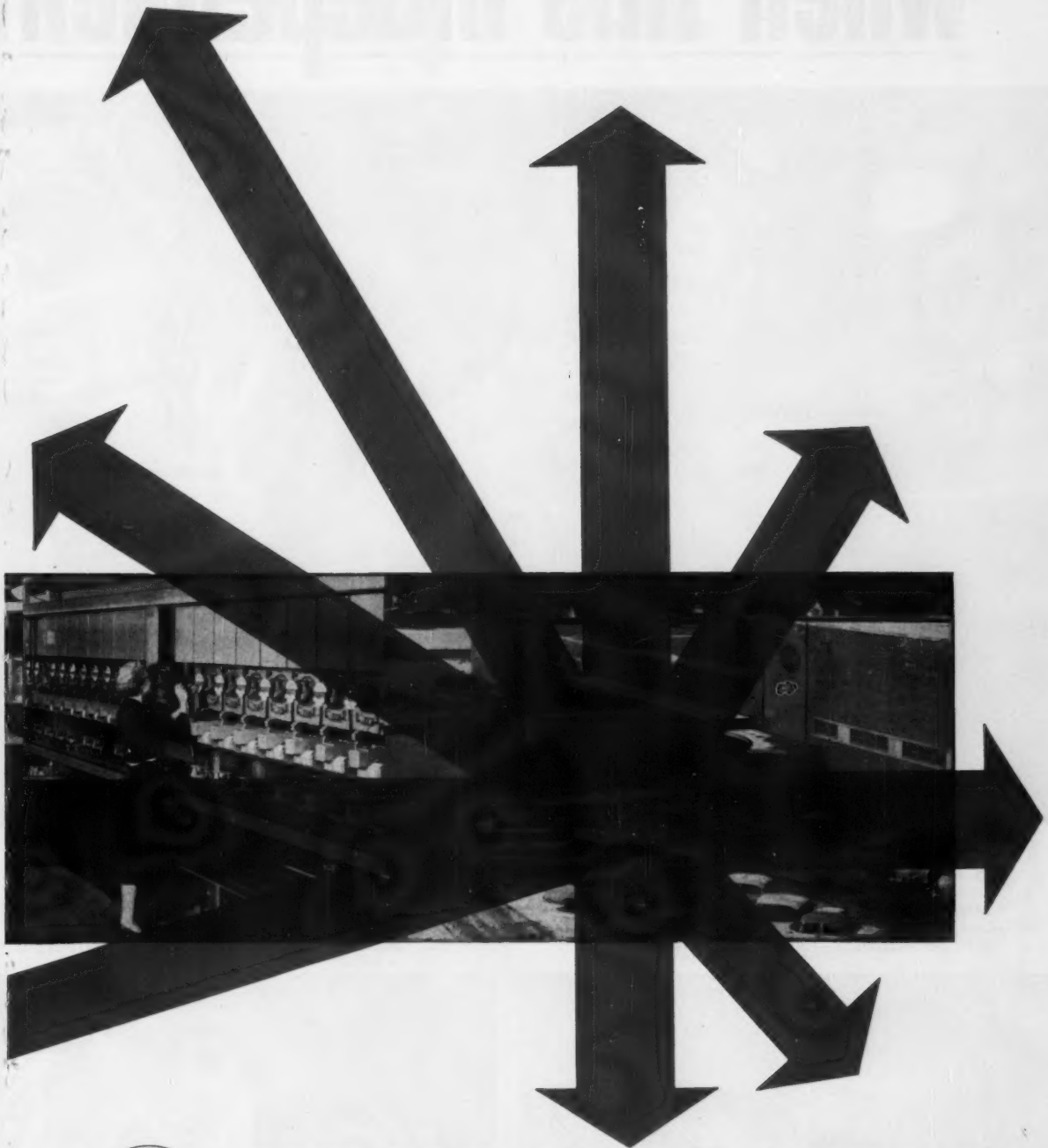
A computer in the role of deliveryman? Sure... for at Sangamo, our IBM computer plays a key role in getting P2 and P3 meters to you faster. We use it to process orders, to program production, and to determine the number of components necessary to produce the meters you need when you want them. It performs these duties in minutes, not days... lets us telescope the time it takes to process your order, assemble, and ship your meters.





SANGAMO P3 (three element) Meters give you full revenue from large loads. Full 200 ampere capacity. Modern, small size, single disk round design cuts weight by 50%—volume by 50%—over that of bathtub-type three-stator meters. Replacement covers for P3 meters save you money, too.

DELIVERY ON POLYPHASE METERS



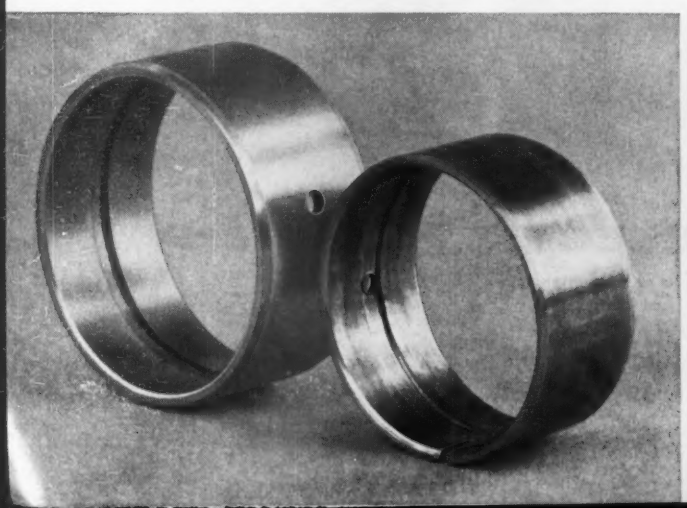
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JH60-9

Onan Electric Plants are when this independent

Big, beefy bearings for longer life. (Lower left) double-size Onan bearings vs. small bearings (right) used in many other makes. Larger bearing surface reduces wear, stretches time between overhauls. Onan builds up to performance—never down-to-a-price.



The engine that ran equivalent to 487,888 automobile miles. Here's endurance no auto could begin to match. Onan engine #1068 was operated for 12,197 hours. It was stop-started 100 times. At test's end #1068 and generator were delivering their stated output.

Performance Certified only tester says O.K.

His job is to provide a double-check on Onan's own tests and testing methods

The man at the left is an expert from an independent testing laboratory. On the job, he believes nothing except what his trained eyes, ears and scientific testing instruments tell him.

He, and others like him, pay frequent surprise visits to Onan factories. He can pull any Onan plant off the test line. Put it through its paces. Recheck the checks Onan engineers and inspectors have already made. He has authority to pull a whole series of plants off the line if he finds one fault. He does all this even though every Onan plant is tested for hours by Onan personnel *before it is shipped.*

Onan takes these special precautions to make *doubly* sure that you get all that you pay for, and more, when you own a Performance Certified Onan. For more details—and an analysis of your primary and stand-by power needs—see the Onan distributor nearest you. He's listed in the telephone classified section in all major cities. Or write direct.

ONLY ONAN GIVES YOU THIS GUARANTEE

PERFORMANCE CERTIFIED
We guarantee that when properly installed and operated this Onan electric plant will deliver the full power and the voltage and frequency regulation promised by its nameplate and published specifications. This plant has undergone several hours of running-in and testing under realistic load conditions, in accordance with procedures certified by an independent testing laboratory.
D. W. ONAN & SONS INC.
Minneapolis 14, Minnesota
Onan

Onan®

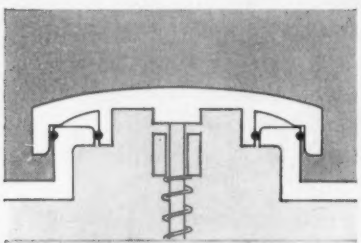
World's Leading Builder of Electric Power Plants

D. W. ONAN & SONS INC., 2512 UNIVERSITY AVE. S.E., MINNEAPOLIS 14, MINN.

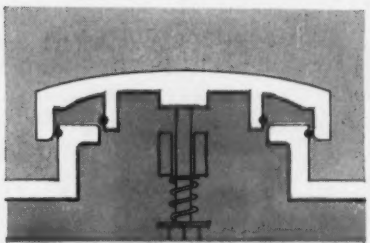
Another Pennsylvania FIRST Ends Transformer Pressure Worries

By JOHN KOEPKE
Mechanical Engineer

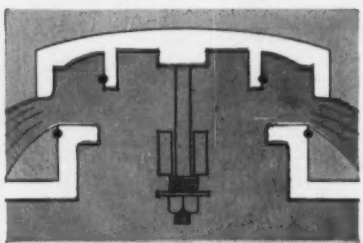
Automatic Pressure-Relief Device Available as Standard Equipment



HERE'S HOW IT WORKS:
1. Pressure-relief device remains closed with normal pressure in the transformer.



2. Overpressure breaks the inside seal . . . extending the pressure area to the outside seal, and accelerating opening.



3. Device is fully open and exhausting gas.

WHY A PRESSURE-RELIEF DEVICE?

Uncontrolled pressures are a potential source of trouble in everything from cooking pots to jet airplanes. Down through the years many kinds of diaphragms and non-resetting relief devices have been used to get rid of potentially dangerous pressures in transformers. None was entirely satisfactory. Diaphragms required replacement. Other relief mechanisms had to be reset. With some designs no one knew for certain at what exact pressure the device would operate. In addition, *all* of the non-resealing mechanisms left the transformer open to possible contamination.

With these problems in mind, Pennsylvania Transformer engineers set out to develop a design so basically simple and yet so dependable that it could be counted on to open *and* close *automatically* whenever needed—whether at frequent intervals or after many years.

TESTS TOLD THE STORY

Since relief of sudden high pressures requires fast opening to a large exhaust area, the Pennsylvania design was proof-tested in a high-pressure tank using gas explosions with controlled rates of rise varying from 50 to *3080* psi per second. Even with a relatively low rate of rise, less than 300 psi per second, it took only eight thousandths of a second for the relief valve to fully open after the preset pressure was reached. Other tests revealed that it is the total size of the exhaust area that primarily controls maximum internal pressure. *This area in the Pennsylvania relief*

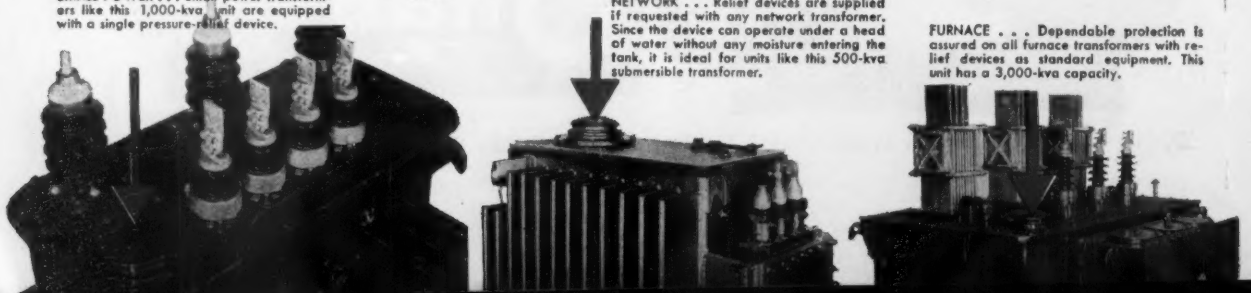
PENNSYLVANIA TRANSFORMERS

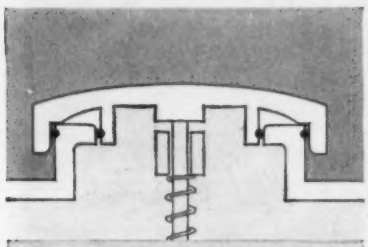
PENNSYLVANIA

SMALL POWER . . . Small power transformers like this 1,000-kva. unit are equipped with a single pressure-relief device.

NETWORK . . . Relief devices are supplied if requested with any network transformer. Since the device can operate under a head of water without any moisture entering the tank, it is ideal for units like this 500-kva. submersible transformer.

FURNACE . . . Dependable protection is assured on all furnace transformers with relief devices as standard equipment. This unit has a 3,000-kva capacity.





4. Valve is reclosed against positive pressure.

device is substantially larger than that of competitive designs.

BOOSTER ACTION HELPS DO THE JOB

When operation occurs, pressure first breaks the main inner seal by moving the valve head only five percent of its total stroke. The area to the outer seal is then exposed to pressure, doubling the opening force and resulting in an extra accelerating kick.

Closure of the relief device occurs automatically before any air is sucked into the transformer where it could produce a secondary explosion. A powerful spring overcomes the force of the gas being exhausted from the tank and reseals the cover while a low gas pressure remains inside the tank.

SURE TRIGGERING ESSENTIAL FOR DEPENDABLE OPERATION

Every Pennsylvania pressure-relief valve will operate within one-half psi of its calibrated setting. Pressure variations due to load changes in the transformer cannot prematurely trigger the device. Operation is controlled solely by a compressed spring held by a nut which is riveted to the shaft at the proper setting. This setting cannot be readily tampered with, and should the relief device be dismantled in the field, the design assures that it will be returned to the correct setting.

FOR SIMPLICITY: JUST TWO MOVING PARTS

Consistent operation *without attention* is assured by an inner pressure seal—an "O"-ring silicone gasket—under radial pressure against a permanently lubricated surface. Manufacturing tolerances are easily controlled to assure proper gasket pressure each time for perfect sealing. Designed with only two moving parts, the device is of simple, rugged construction with every part—aluminum housing, stainless steel shaft, and silicone "O"-ring gaskets—selected for minimum maintenance.

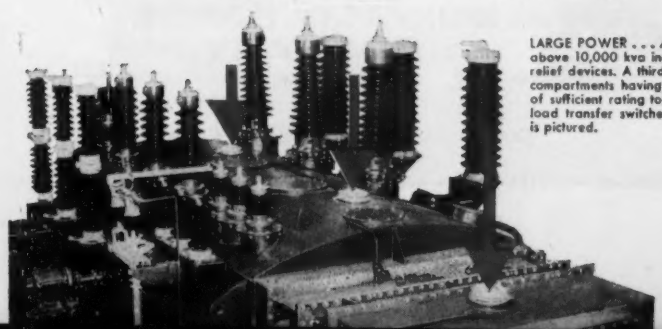
Optional extras include alarm contacts and a visual operation indicator easily reset from the ground.

* * *

Our newly introduced Pennsylvania Transformer relief device is now available as *standard equipment* on Pennsylvania Transformers. Additional information is available on request from Power Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

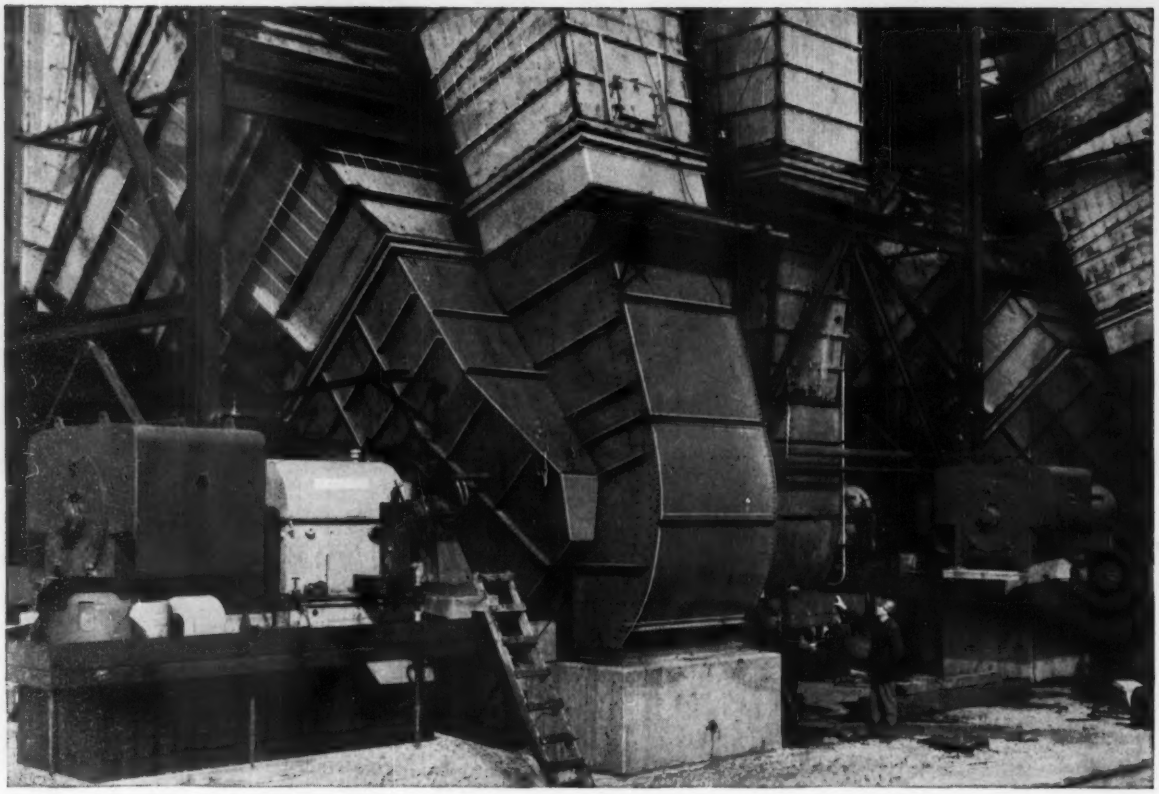
McGRAW-EDISON

POWER TRANSFORMERS



LARGE POWER . . . All power transformers above 10,000 kva incorporate at least two relief devices. A third device is supplied on compartments having a tap-changer switch of sufficient rating to require contactor-type load transfer switches. A 100,000-kva unit is pictured.

ASKAREL-FILLED . . . All askarel-filled transformers like this 500-kva unit for a Secondary Unit Substation are equipped with the new Pennsylvania relief device.



HOW DO YOU SELECT MECHANICAL DRAFT FANS?

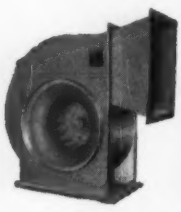
By price alone? Undoubtedly not because proper fan performance cannot be obtained by cut-rate methods. It must be engineered and built to a standard, not a price.

"Buffalo" Mechanical Draft Fans are built to an engineering standard with over 80 years experience and hundreds of installations to back it up. This engineering experience combined with "Q" Factor* construction makes the complete line of "Buffalo" Mechanical Draft Fans a best buy in the long run.

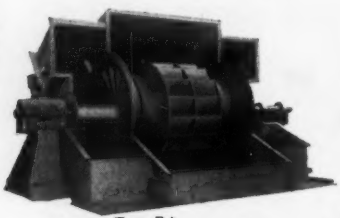
Be sure to phone your "Buffalo" Engineering Representative when you want reliable, high efficiency, long life mechanical draft fans.

*The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

Type CR
Radial Blade Fan.



Type BLH
Backward Curve Fan.



Type BA
Airfoil Fan.

"Buffalo"

BUFFALO FORGE COMPANY

Buffalo, New York

Buffalo Pumps Division • Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

The Electrical Week

LATE NEWS ▶ **High Mountain Sheep Dam gets over big hurdle.** Oregon Water Resources Board recommends issuance of a license to Pacific Northwest Power Co. State Hydroelectric Commission is expected to follow the Board's recommendation.

Washington Wire . . . Joint Economic Committee plans to probe extent and value of federal subsidies, saying present pattern "has been piecemeal and gradual" . . . Public utilities to spend $6.1 billion for new plant and equipment in '60, according to SEC report . . . AEC fiscal '61 budget requests include funds for second core and heat sink for Shippingport, and a $15-million R&D fund for utilities willing to build large reactors . . . U. S. and Canada to hold third meeting on joint development of Columbia River in Ottawa, Mar. 31-April 1.

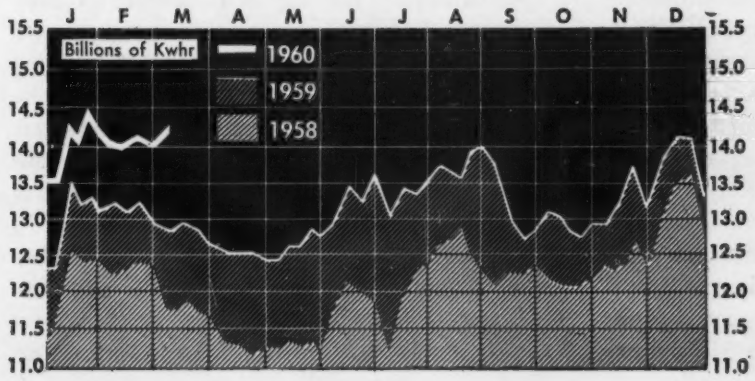
Denver firm gets contract for nationwide Yugoslavian HV grid. Engineering Consultants, Inc, will plan and design transmission system under contract arranged through International Cooperation Administration.

Around the States . . . Tampa Electric will need to double its facilities within five years to meet Florida growth, Pres. W. C. MacInnes tells N. Y. Society of Security Analysts. He sees $150-million outlay; company's present plant investment is $161 million . . . San Diego G&E and IBEW agree on 4½% wage hike . . . Consumers Power Co supervisory employees maintain service following strike by Utility Workers of America.

Russia plans 2.4-million kw thermal stations. Moscow announces that an undisclosed number of big plants—each with eight 300,000-kw turbogenerators—will be built during current seven-year plan.

Obituary . . . Sen Richard Neuberger (D-Ore.), 47, on March 8, at a hospital in Portland, Ore.

WEEKLY POWER OUTPUT—Up 10.2% (Week ending Mar. 5), Kwhr 14,262,000,000



Per Cent Change From Previous Year

	Feb. 20	Feb. 27	Mar. 5
Total U. S.	+ 7.3	+ 8.6	+10.2
New Eng.	+ 3.2	+ 3.3	+ 5.3
Mid. Atlan.	+ 6.6	+ 7.2	+ 9.2
Cent. Ind.	+ 7.7	+ 8.5	+ 9.0
West Cent.	+ 5.4	+ 8.3	+ 9.4
Southeast	+ 9.2	+ 9.8	+10.5
South Cent.	+ 9.5	+ 9.8	+11.0
Rocky Mount	+ 5.5	+ 9.4	+15.2
Pacific			
NW	+ 4.7	+ 6.4	+15.7
SW	+ 6.6	+12.3	+10.5

Seasonally Adjusted Index 276.1

Week Ago 273.9 Year Ago 250.1

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **The world's largest underground power station is being completed** at Chute-des-Passes in northern Quebec. Its five hydraulic turbines will produce one million hp. It took three years to build and cost $150 million **(p 60)** . . . Severe storms during the first week of the month caused damage and outages throughout the country. Paradoxically, some of the biggest snows were accompanied by the slightest damage **(p 62)** . . . Supreme Court decides against Tuscarora Indians in reservoir land case **(p 63)** . . . Glen Canyon ground rules are discussed **(p 63)** . . . Payola suspected at Priest Rapids **(p 64)** . . . Five companies are nominated for Edison Award **(p 64).**

ENGINEERING ▶ **A small computer calculates the billing of power interchanged** by Boston Edison and four other systems. It works with great speed, accuracy and consistency **(p 67)** . . . Meanwhile, Atlantic City Electric is going to customer accounting equipment that prints 600 lines a minute, folds the results to postcard-size, and allows for optical scanning of receipts **(p 70)** . . . Public Service of New Jersey uses a converted ferry boat as a mobile construction headquarters at site of an addition to its Sewaren Steam Station **(p 72)** . . . Dual-voltage transformers prove economical in South Carolina E&G's conversion to higher distribution voltage **(p 74).**

Politics and Public Power

SOME BACKGROUND FOR A NEW STUDY

The supporters of public power in the Pacific Northwest have been notably unenthusiastic about a proposed federal transmission tie between Bonneville Power Administration and California. Part of the basis for their lack of ardor lies in the fact that they are not convinced that exporting Northwest power is in their best interest. The study now being done for the California Dept of Water Resources, if it results in a recommendation for a large federal line operated as a common carrier, will probably be accompanied by recommendations from Gov Brown designed to allay their fears.

Some indications that the California proponents of a large federal intertie are aware of the Northwest's misgivings came at a recent meeting of the California Municipal Utilities Assn in Santa Monica. Ralph M. Brody, assistant to the Director of Water Resources for the state and advisor to Gov Brown, put it this way: "A very natural apprehension might exist in the Pacific Northwest regarding any transfer of power from that area into California. For this reason, it is important that appropriate legislation be enacted to provide for priority of use in the Northwest so far as federal power is concerned. In cooperation with the States of Oregon and Washington, we are presently drafting such legislation. The right to withdraw power sold by others can be protected through contract provisions. Governor Brown has repeatedly stated his support of a policy protecting the areas of origin."

Brody told EW that he hopes the legislation now being drafted will pass the present session of Congress.

Until now the controversy surrounding the

PROCUREMENT & PRODUCTS ▶ **Coal men are battling to (1) regain their utility market position** in the East, and (2) to get Congress to hammer out a national fuels policy . . . Arraignments in anti-trust cases are scheduled for Wednesday, March 16 **(p 101)** . . . GE is building a 960-kv, 1,600-amp disconnect switch with impulse rating of 2,300-kv **(p 102)** . . . Westinghouse's Cresap urges tax-law change to encourage basic research **(p 103)** . . . Isolated-phase bus reduces circulating currents **(p 105).**

MANAGEMENT ▶ **1959 was the best year ever for the electric utilities.** Net incomes rose almost 9% over '58 levels, based on an EW sampling of 144 investor-owned companies which account for about 95% of the private industry's billings. The East North Central region led the field with a 12.5% gain over 1958. Trailing the pack were utilities in the Pacific region, showing a mere 3.7% gain. Total net income in EW's sampling—$1.55 billion **(p 93).**

SELLING ▶ **Quartz lamps "Summer-ize" winter window shoppers in Chicago** . . . NEMA sees 1.75 million electric range shipments for 1960 **(p 109).**

NEXT WEEK ▶ **Read a four-page analysis on providing cooling water.** The story details one of several water schemes for PEPCO's Dickerson Plant.

tie has involved only two areas: that served by Bonneville power and California. Whether, as a result of widening the scope of the new study other areas will become involved, remains to be seen. Brody's remarks in this regard are interesting:

"Typical of all developments in the Pacific Northwest is the high level of energy in proportion to installed capacity. In Canada, there are prime streams still virtually untapped. In Alaska, the possibilities for unprecedented large-scale hydro development simply await a market for the output. Any study concerned with exporting excess power should consider the probable feasibility of such projects."

It seems fairly certain that the scope of the new study, if not widened in a geographic sense, will be broadened so that it takes much more into consideration than did the Bonneville study favoring a Pacific Gas & Electric Co 230-kv tie.

Indeed, Brody said "We are not satisfied that the report (the BPA one) goes far enough in considering all of the conservation benefits . . . Simply putting displacement of fuel (that saved in California thermal stations by using surplus Bonneville hydro) on an economic basis does not take into consideration benefits derived from conserving our non-renewable fuel sources." Brody also pegged the failure of the report to give weight to what he termed "the national defense aspects" of a heavier federal common carrier line, or the "enhanced feasibility" resulting from the line opening markets earlier for the available hydro power.

This is some of the background against which the new study will be made. It will be interesting to look at the results some 28 weeks hence.

Nuclear Notes

Prominent spokesmen at "202" hearings before the Joint Committee on Atomic Energy have touched significantly on the future of nuclear reactors:

Dr Chauncey Starr, general manager of Atomics International, said practical bounds of pressure vessel size and attempts to add integral superheat are apt to limit power obtainable from light-water reactors, in commenting on the Civilian Power Reactor Program. He saw the utility trend to larger central stations ultimately leading to the replacement of the present light-water reactor with organic-cooled and moderated types, sodium-graphite units and water reactors with pressure tubing.

Elmer Lindseth, EEI atomic spokesman, reminded congressmen that "in a truly free enterprise . . . there is no proper place for government ownership of commercial-type power reactors. . . . The utility industry should construct, operate and own all large-scale power reactors," but such reactors "should be installed only when . . . substantially competitive."

AEC hearings on the issuance of a permit for construction of the proposed 75-Mw high power density BWR Big Rock Point, Mich., plant by Consumers Power is scheduled for March 29. A week later, the commission will consider General Electric's application to modify their Vallecitos, Calif., reactor. GE seeks to install a new type of control rod and pneumatic control rod drive system, with a new fuel arrangement; also to operate the reactor with both turbine and electric type coolant circulating pumps.

Coming drop in British uranium prices, prompted by the current world surplus, is expected to encourage nuclear development in a number of countries. Observers believe it may lower the present $25.40 per lb to $21.30.

Final design contract for a BWR with nuclear superheat has gone to General Nuclear Engineering Corporation of Dunedin, Fla. The demonstration reactor will add 16,300 kw to the system of the Puerto Rico Water Resources Authority, which will furnish the site and turbo-generating facilities. The contract should be worth $2 million to the Combustion Engineering division.

Mobile nuclear plants moved forward a pace when the Army's Gas Cooled Reactor Experiment No. 1 at Idaho Falls became critical in February. The 2,200-kw unit is water-modulated and nitrogen-cooled.

Current technology for processing spent reactor fuels is reviewed in the recently published proceedings of last October's AEC symposium on Chemical Processing of Irradiated Fuels held at Hanford. It is available from the Office of Technical Services, Dept of Commerce, Washington 25, D. C. 450 pages, illustrated. Price $4.50. Also new: the AEC's Major Activities in the Atomic Energy Programs, 1959. For sale by the Supt of Documents, U. S. Govt. Printing Office, Washington 25, D. C.

Exclusive with VAREX®

contacts are made outside the active dielectric under strong spring pressure
CONTAINER
SECONDARY INSULATION
ELEMENT SHOWING EXTENDED FOIL AT END
CONTACT PLATE UNDER SPRING PRESSURE
PACK ASSEMBLY

Varex is the *only* capacitor whose elements are totally free of mechanical insertions in the active dielectric!

Varex engineers have eliminated these mechanical insertions, or tabs, from the dielectric by means of the exclusive "extended foil" design. As shown above, every turn of foil extends beyond the paper dielectric and makes a broad contact with a plate under strong spring pressure.

This exclusive Varex design has thus removed a possible source of mechanical damage during winding, and a cause of higher electrical stress in the adjacent paper dielectric.

This means lower current density, cooler operation, and appreciably longer life for Varex capacitors!

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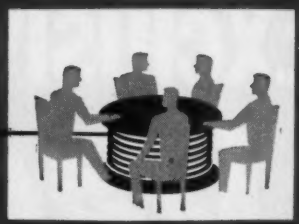
PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10024-H

DU PONT

WIRE AND CABLE ROUND TABLE



You have asked...

Q. What are the facts on the moisture resistance of insulation made from ALATHON® polyethylene resins?

A. Water itself has no effect on ALATHON. Even during prolonged aging, water does not cause swelling or changes in strength and stiffness. The ultimate weight gained by samples immersed in water is considerably less than 1%. More important, and a fact often overlooked, the presence or absence of water has no effect on the excellent electrical properties of polyethylene.

Water has been stored in 4-oz. polyethylene bottles (1/32" wall thickness) for periods up to a year, after which time it was found that the amount of water lost by transmission through the bottle was less than 0.3%. In fact, polyethylene is widely used as pipe to transport water, and as construction film to form a moisture barrier. The most important point to remember is that the presence or absence of water in no way affects the electrical properties of the polyethylene insulated wire or the performance of the wire.

Q. Does corona produce a surface effect or an internal one?

A. A surface effect. In case of voids in the body of an insulation, corona appears only on the inside surface of the void.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins for insulation and jacketing.

• Electrician connects cable jacketed with ZYTEL to runway lights before placing cable in sawcut.

FAA uses jacket of Du Pont ZYTEL® 37X, for unique new runway lighting system

Under comprehensive analysis at the Federal Aviation Agency's National Aviation Facilities Experimental Center, Atlantic City, N. J., are new systems of airport lighting. Attempting to speed the development of air traffic control to meet the demands of the jet age, the NAFEC has installed a new system of "pancake" lights in a 10,000-foot instrument runway. This installation required 70,000 feet of electrical wire.

Between individual lights set in the concrete runway, a 1-inch-deep sawcut was made to protect the wires connecting the lighting system. These sawcuts presented a tough installation problem for two reasons. First, because of the sharp edges of the concrete, and second, because a tapered instrument had to be used to push the wire into the sawcut. After inspecting various materials, FAA's Bureau of Research and Development, with the help of the Plastic Wire and Cable Company, Jewett City, Conn., decided to use a jacket of Du Pont ZYTEL 37X for the wire.

There are other advantages provided by the jacket of ZYTEL nylon resin. It resists the chemicals in the sealant used to fill the sawcuts, and is unaffected by the extremes of summer heat and winter cold. And ZYTEL is so tough that it can provide lasting protection with a minimum thickness. Thus, the wire is light and easy to ship, handle and install.

It will pay you to investigate how ZYTEL and the other Du Pont plastics may help you solve your wire and cable problems. Find out how by writing your wire and cable supplier, or: E. I. du Pont de Nemours & Co. (Inc.), Department M-314, Room 2507A, Nemours Building, Wilmington 98, Del. In Canada, Du Pont of Canada Limited. P. O. Box 660, Montreal, Quebec.

POLYCHEMICALS DEPARTMENT

DU PONT

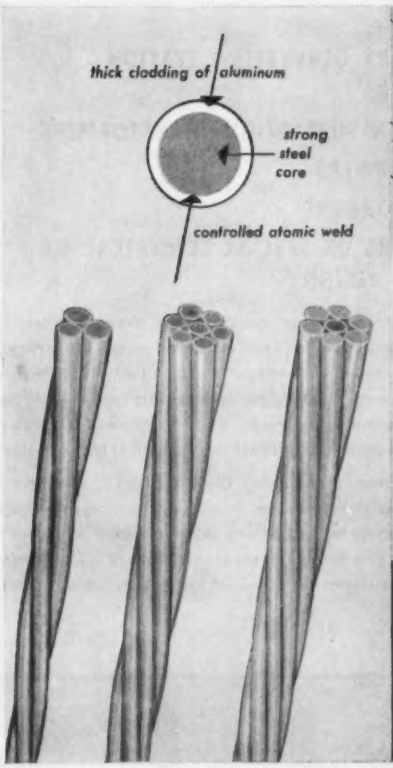
REG. U. S. PAT. OFF.

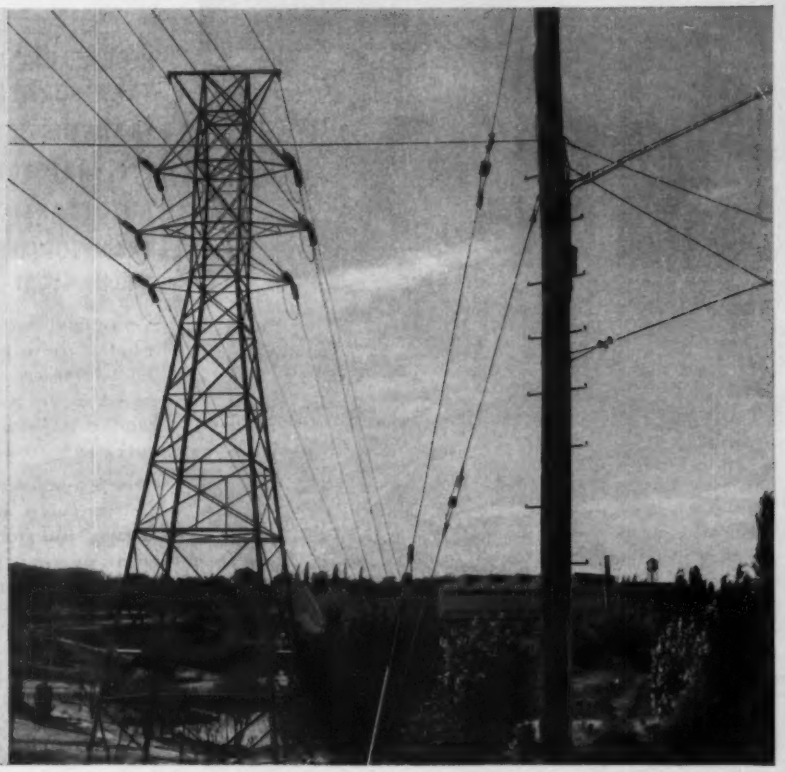
Better Things for Better Living . . . *through Chemistry*

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS

The *Alumoweld technique* of welding aluminum to steel

means TOP PERFORMANCE... LONG LIFE... LOW COST





● You cut costs and assure top performance of your overhead lines when you use Alumoweld for overhead ground wire, guys, messengers, and ACSR core wire ● You'll have no maintenance worries because a thick cladding of pure aluminum permanently protects Alumoweld's high-strength steel core from corrosion. In fact, Alumoweld has the same corrosion resistance as solid aluminum wire—and 33% of the electrical conductivity. Compared to steel, Alumoweld has three times the conductivity . . . is 18% lighter . . . just as strong . . . and will last far longer.

For overhead ground wire, Alumoweld is tops. The high strength-to-weight ratio permits stringing with smaller sags, thus increasing the mid-span clearance. Its excellent conductivity quickly discharges lightning currents to ground—reduces service interruptions.

For guys and messengers, Alumoweld gives long, trouble-free life because it cannot rust. And it's strong and easy to install.

For core wire in ACSR Conductors, Alumoweld eliminates the danger of electrolytic action because it is compatible with solid aluminum wires. It coordinates the life of the strength members with that of the conductor members.

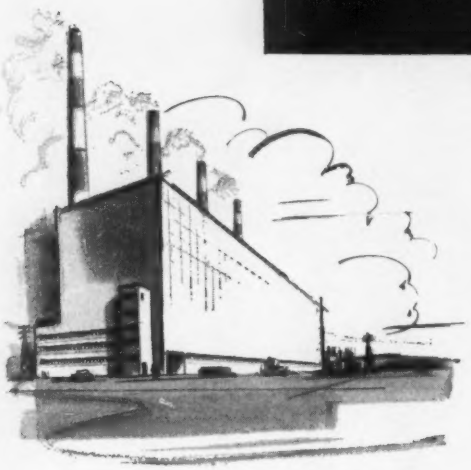
Get all the facts on this low-cost wire and strand by writing today for bulletin E.D. 3000.

ALUMOWELD

COPPERWELD STEEL COMPANY

...a for every application

Moloney



HIGH CAPACITY GENERATING STATION TRANSFORMERS

TRANSMISSION SUBSTATION TRANSFORMERS

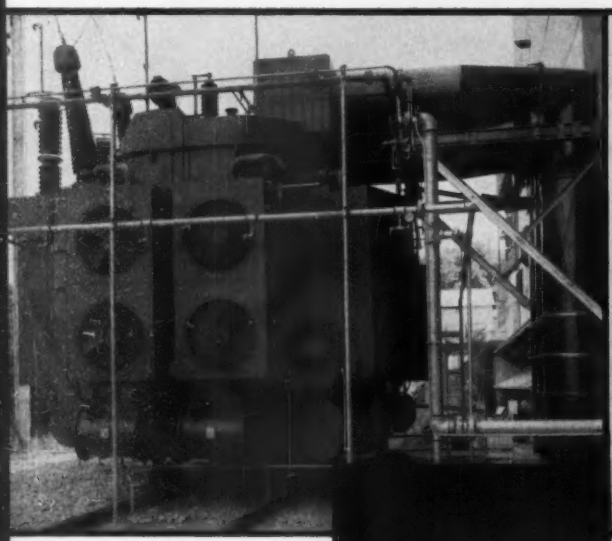
LTC TRANSFORMERS

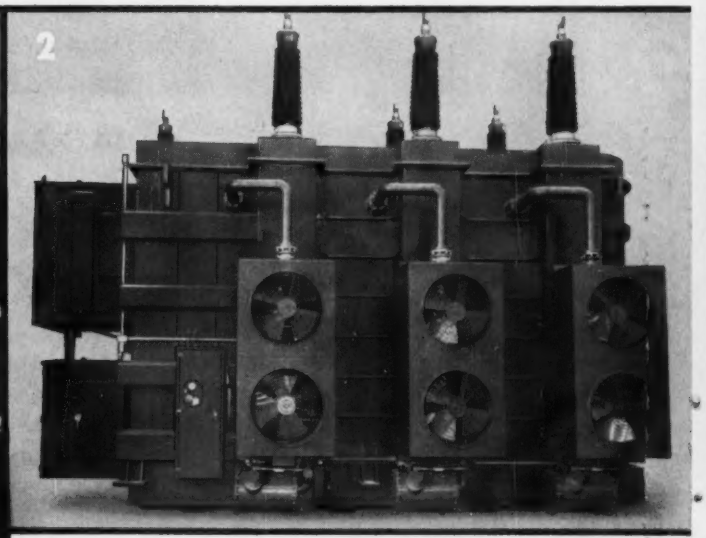
AUTOTRANSFORMERS

TRANSFORMERS OF SPECIAL ELECTRICAL OR MECHANICAL DESIGN

Versatility in transformer design and manufacture is one of the attributes which contribute to Moloney's leadership in the transformer field. Shown here are some of the many instances where Moloney has designed transformers to meet the exact requirements dictated by the peculiarities of the specific installation.

These installations exemplify the flexibility, versatility and capacity which enable Moloney to manufacture quality transformers for every application. Whatever your power transformer requirements . . . Specify Moloney Transformers . . . All Along The Line.





MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities,

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Transformer

1 *217,000 KVA, Class FOA, 13.5—234 KV*
Potomac Electric Power Company

2 *160,000 KVA, Class FOA, 161—115 KV & 13.8 KV @ 42,000 KVA, LTC Autotransformer*
Kansas City Power & Light Company

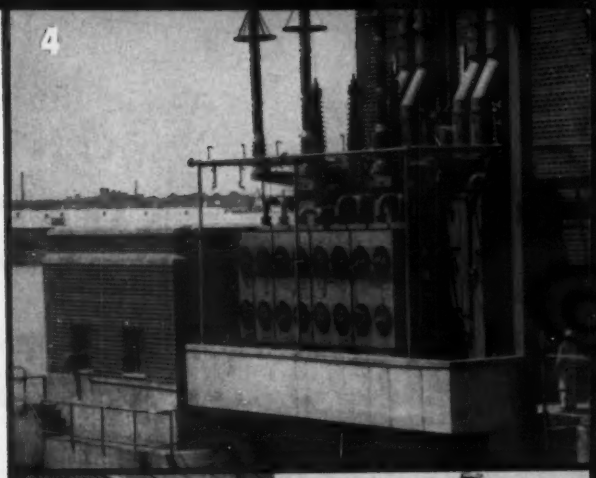
3 *135,000 KVA, Class FOA, 13.8—115 KV*
New Orleans Public Service, Inc.

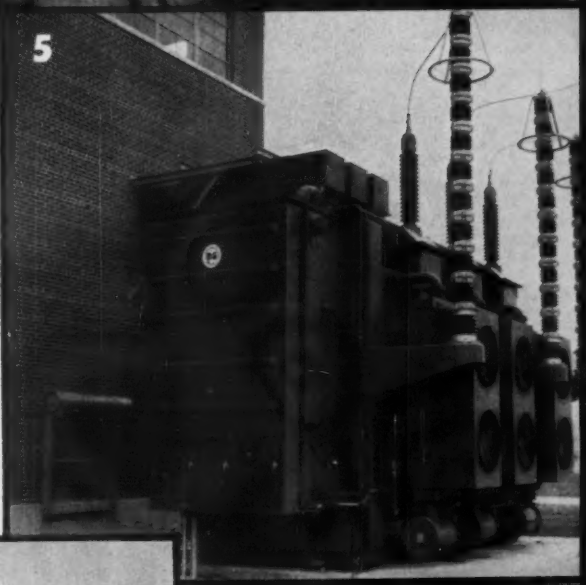
4 *125,000 KVA, Class FOA, 13.8—138 KV, LTC*
Union Electric Company

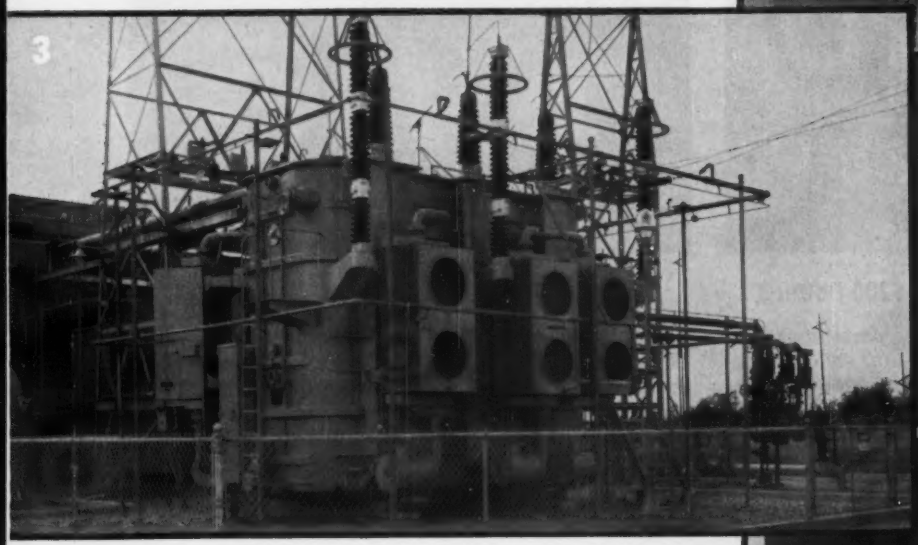
5 *100,000 KVA, Class FOA, 14.4—161 KV, LTC*
Iowa Power and Light Company

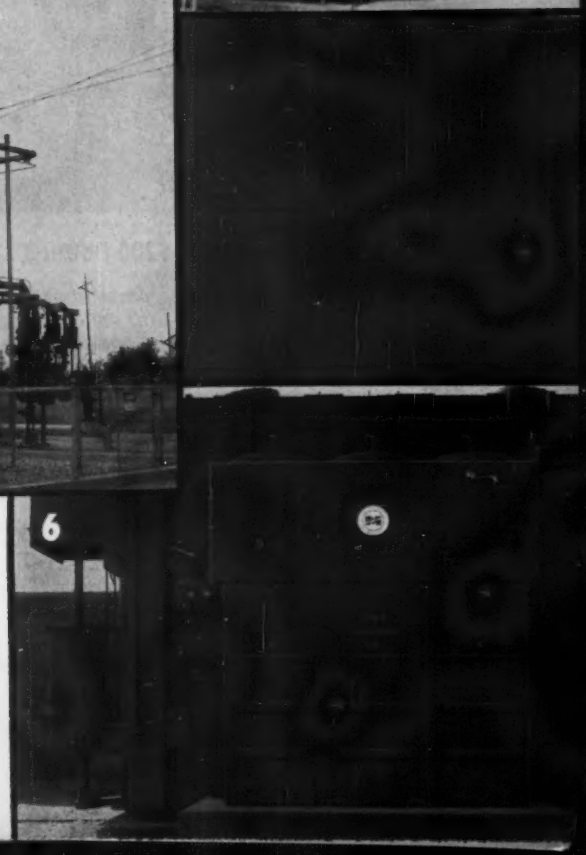
6 *20,000/26,667 KVA, Class OA/FA, 132—12.6 KV, LTC*
Commonwealth Edison Company

ME59-12





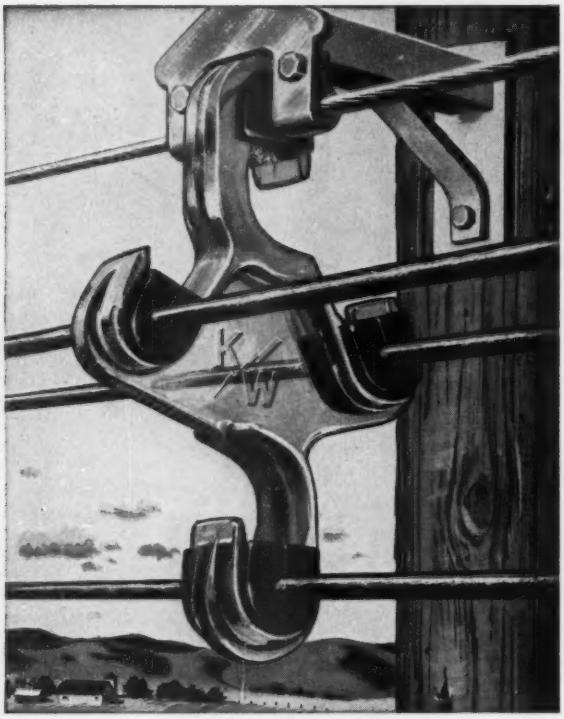




Industry and Electronic Applications

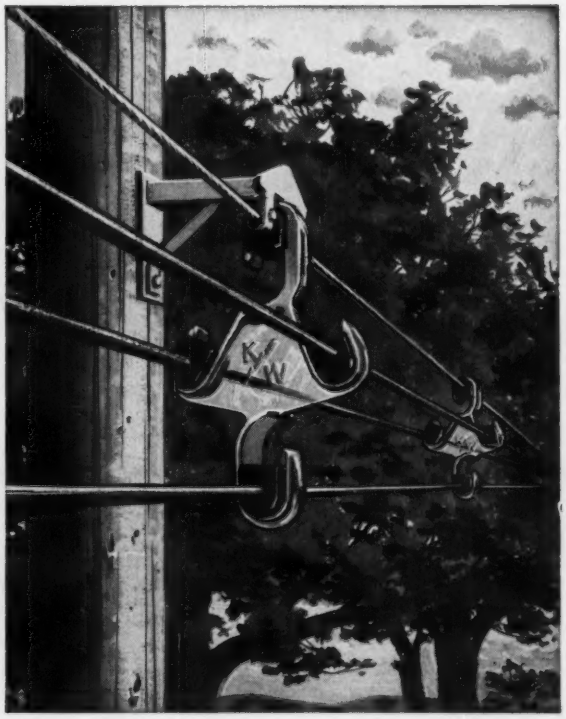
SALES OFFICES IN ALL PRINCIPAL CITIES

NEW K/W SPACER TYPE AERIAL ADDS STRENGTH, CUTS COSTS,



One-Piece Design—Supports 1200 Pounds

New solid spacer design has no loose parts nor movable pieces . . . it's simple, reliable and strong. Can support a minimum distributed load of 1200 pounds. Easy to install, since only one conductor is handled at a time. Snap-in grommets shaped to ease installation. Can be used with or without crossarms; standard hardware available from many suppliers.

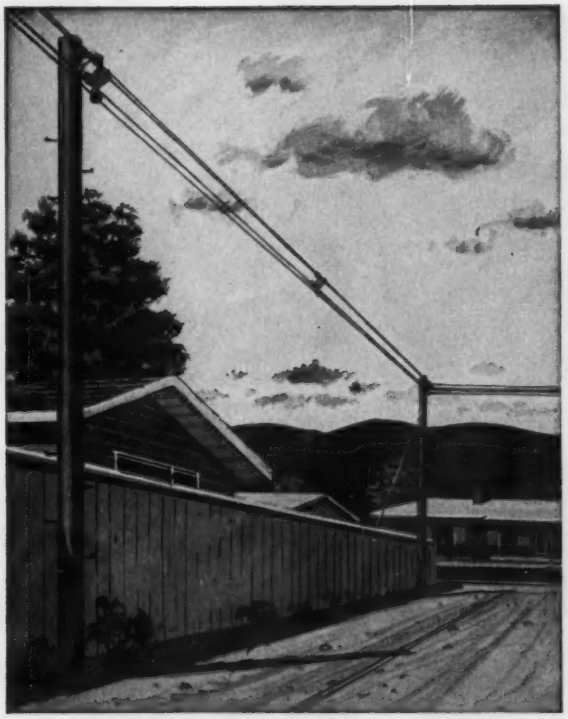


Cuts Material Costs and Tree Trimming

A KW Spacer Cable system can be installed for as little as one half the cost of standard pre-assembled aerial cable!

Compared to open-wire weatherproof, the reduced tree trimming and improved system dependability resulting from messenger supported cables can justify the spacer system's slight additional cost.

CABLE SYSTEM IMPROVES APPEARANCE



Reduced Spacing Improves Appearance

Compared to open wire, closely spaced conductors present a neat, compact arrangement that improves appearance wherever it is installed. Close 6-inch spacing also improves system electrical characteristics . . . permits easy phase identification and proper load balancing. Usual installation practice is approximately 35 spacers per 1000 feet.

With its unique new spacer design, KW now offers you unsurpassed dependability and handling ease for cable systems operating at 5 to 15 kv, by using only one spacer for the whole range of voltages.

No tools or tightening necessary: entire spacer system snaps in and locks.

The system consists of four parts: (1) Phase conductors (EC grade aluminum, minimum conductivity 62 per cent, insulated with Polyethylene or Butyl rubber with Neoprene jacket); (2) Special high-strength messenger; (3) Molded one-piece spacers; (4) Molded Neoprene cable-retaining grommets.

Standard hardware is available from leading suppliers. Call your Kaiser Aluminum sales office or KW distributor for immediate service and full information.

Kaiser Aluminum & Chemical Sales, Inc., 300 Lakeside Drive, Oakland 12, California.

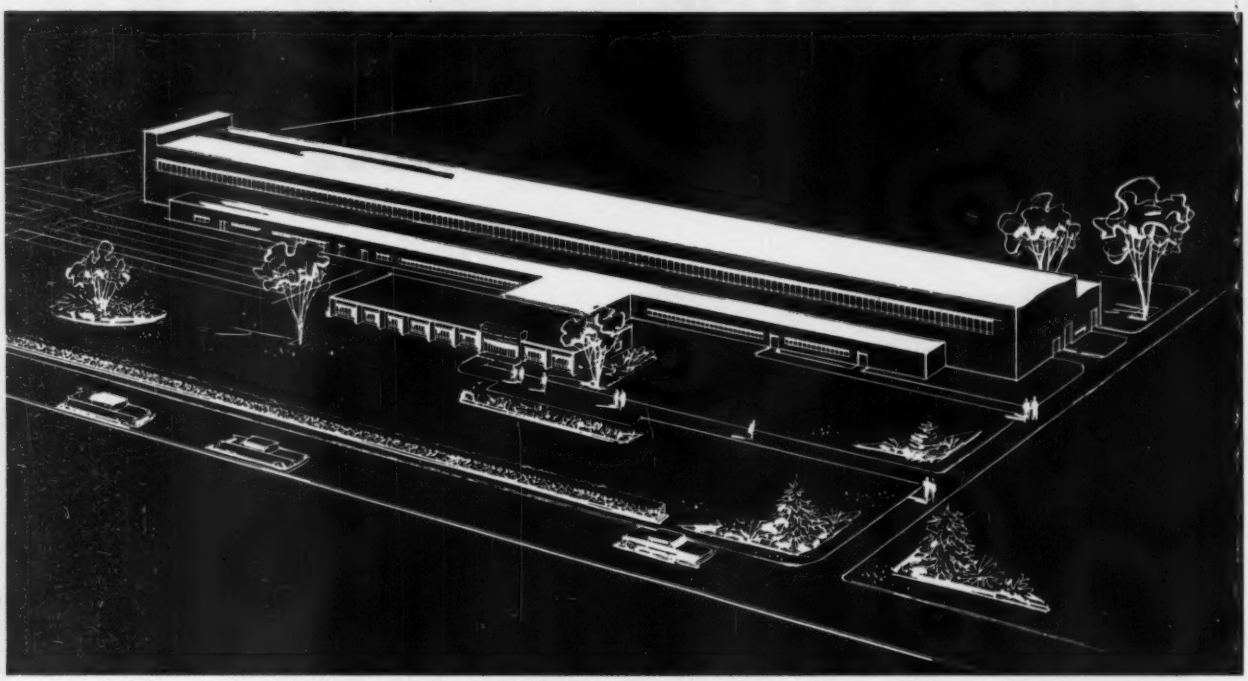
KAISER ALUMINUM*

"IF IT CARRIES CURRENT, KW CARRIES IT!"

*TRADEMARK KAISER ALUMINUM & CHEMICAL CORPORATION

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

To Serve Electric



Artist's conception of Kellogg's new Power Piping Division headquarters and plant at Williamsport, Pennsylvania. The entire site covers about 50 acres.

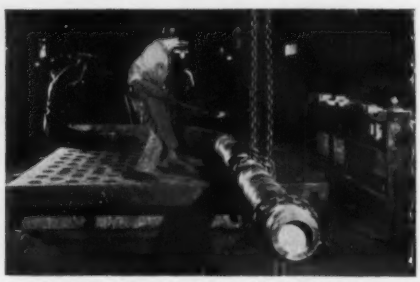
KELLOGG

As operating temperatures and pressures increase in central power generating stations, the need for stronger and superior materials, and for better methods of manufacturing power piping systems, becomes more acute.

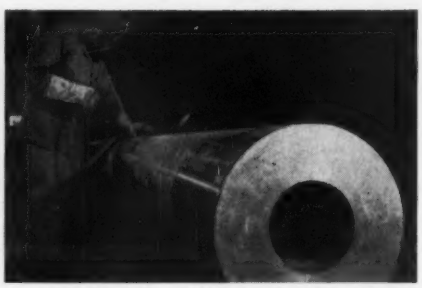
To help solve these problems, The M. W. Kellogg Company's Power Piping Division is building new metallurgical and welding laboratories as part of its complete manufacturing facilities at Williamsport.

The laboratory facilities and personnel, in addition to performing applied research and development for manufacturing power piping, will be available for consultation with clients on their problems and will act as a customer service laboratory.

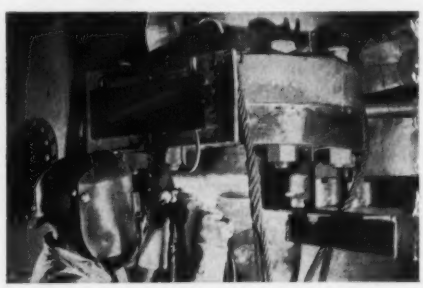
In the laboratory, a Kellogg metallurgist places sample of austenitic steel in heat-treating furnace. After heat treatment, the steel sample will be cut into sections and tested.



In the pipe bending shop, a length of stainless steel piping is bent to close tolerances. Dam in pipe retains inert gas introduced during heat treating to prevent oxidation.



In the welding shop, two heavy-walled sections of stainless steel power piping are joined by K-Weld—an inert gas-shielded technique of arc welding, patented by Kellogg, which assures long life.



In the customer's plant, a Kellogg operator uses K-Weld to install heavy sections of power piping which carry superheated steam from boilers to generators.

Utilities Still Better

Power Piping Division of M. W. Kellogg is Building New Headquarters and Manufacturing Plant in Pennsylvania

To still further improve the service it has given to electric utilities for over 40 years, the Power Piping Division of The M. W. Kellogg Company is now building new headquarters and a plant at Williamsport, Pennsylvania.

To be completed by Labor Day, the plant will specialize in the manufacture of high pressure, high temperature alloy and carbon steel piping for electric generating stations. Centrally located in Pennsylvania, Kellogg's Williamsport plant will be within easy distance from many Eastern industrial centers. From here, it is well situated to serve clients by road, rail, or air.

Representing an investment of approximately $4 million, these new facilities will have no equal in the power piping industry. Incorporating the most modern and time-saving equipment, the facilities have been designed throughout for maximum efficiency and economy.

With completion of its new plant, Kellogg will be better equipped than ever to start with any power piping problem from scratch, and to carry it through to the actual installation in customers' central stations from coast to coast.

At its new plant, Kellogg will have the engineering skills to manufacture complex piping systems; the men and equipment to cut, machine, bend, weld and heat treat piping of varying sizes and wall thicknesses.

Here, Kellogg will have the equipment to make electronic, radiographic, ultrasonic and other advanced tests to inspect the quality of the finished product. Here, it will have the metallurgical and welding laboratories to evaluate new and superior piping materials; to maintain a continuing program of development in welding and other manufacturing techniques, and add still further to its line of industry "firsts" listed at the right.

Kellogg's Power Piping Division welcomes inquiries on its new facilities from engineers of power generating companies, consulting engineers, and manufacturers of turbines, boilers, and allied equipment.

OTHER KELLOGG FIRSTS IN POWER PIPING

In 1931, Kellogg manufactured the first all-welded piping for the first high-temperature, high-pressure central station in the United States. Kellogg manufactured the first austenitic steel piping for a central station installation and has been continually experimenting since to establish the best materials, manufacturing techniques and heating cycles for welding and post-welding treatment, and to set specifications for electrodes.

FIRST IN MANUFACTURING OF:

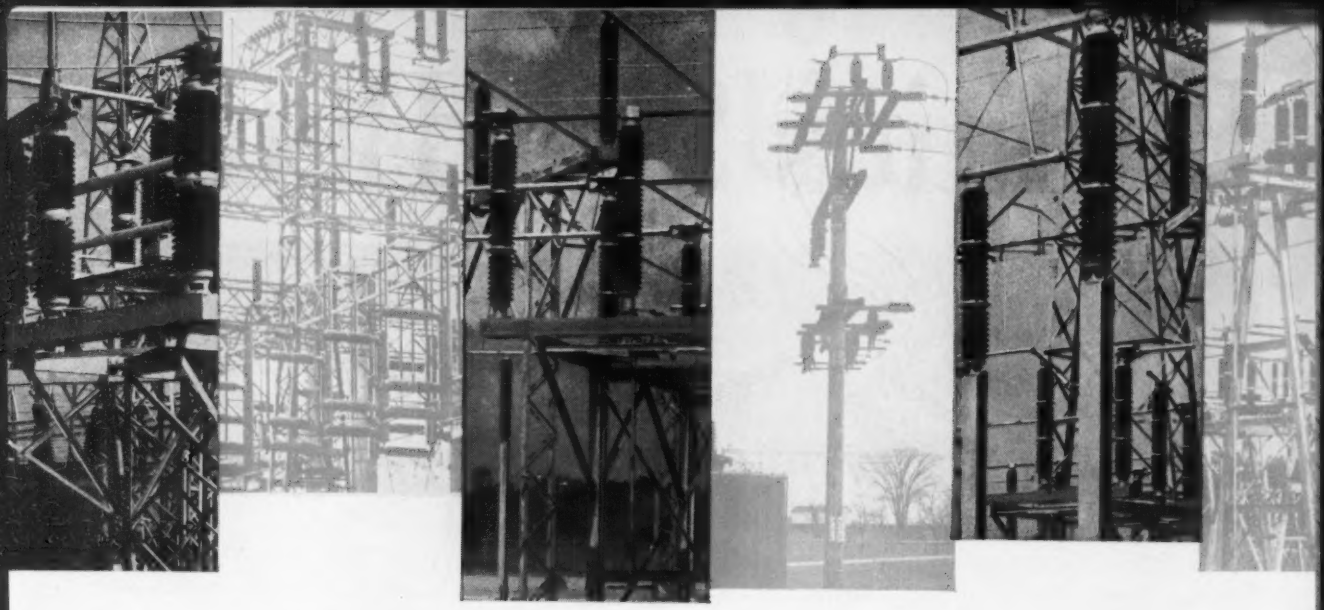
Piping from C ½% Mo
Station piping for 900 F.
Station piping for 950 F.
Station piping for 2200 psi
C ½% Mo piping with
#3-#5 actual grain size
1¼% Cr-½% Mo steam piping
Steam piping for 1000 F.
½% Cr-½% Mo station piping
2% Cr-½% Mo station piping
Station piping for 1000 F.
2¼% Cr-1% Mo station piping
1¼% Cr-½% Mo station piping
1% Cr-1% Mo V turbine piping
2¼% Cr-1% Mo V station piping
Station piping for 1050 F.
3% Cr-1% Mo station piping
Type 347 stainless turbine piping
Mercury vapor piping for 1000 F.
Station piping for 1003 F. for France
Type 347 stainless station piping
Station piping for 1100 F.
Type 316 stainless station piping
Type 316 stainless station piping for
3500 psi-1050 F., 325 MW
Type 316 stainless station piping for
5600 psi-1200 F., 325 MW

KELLOGG

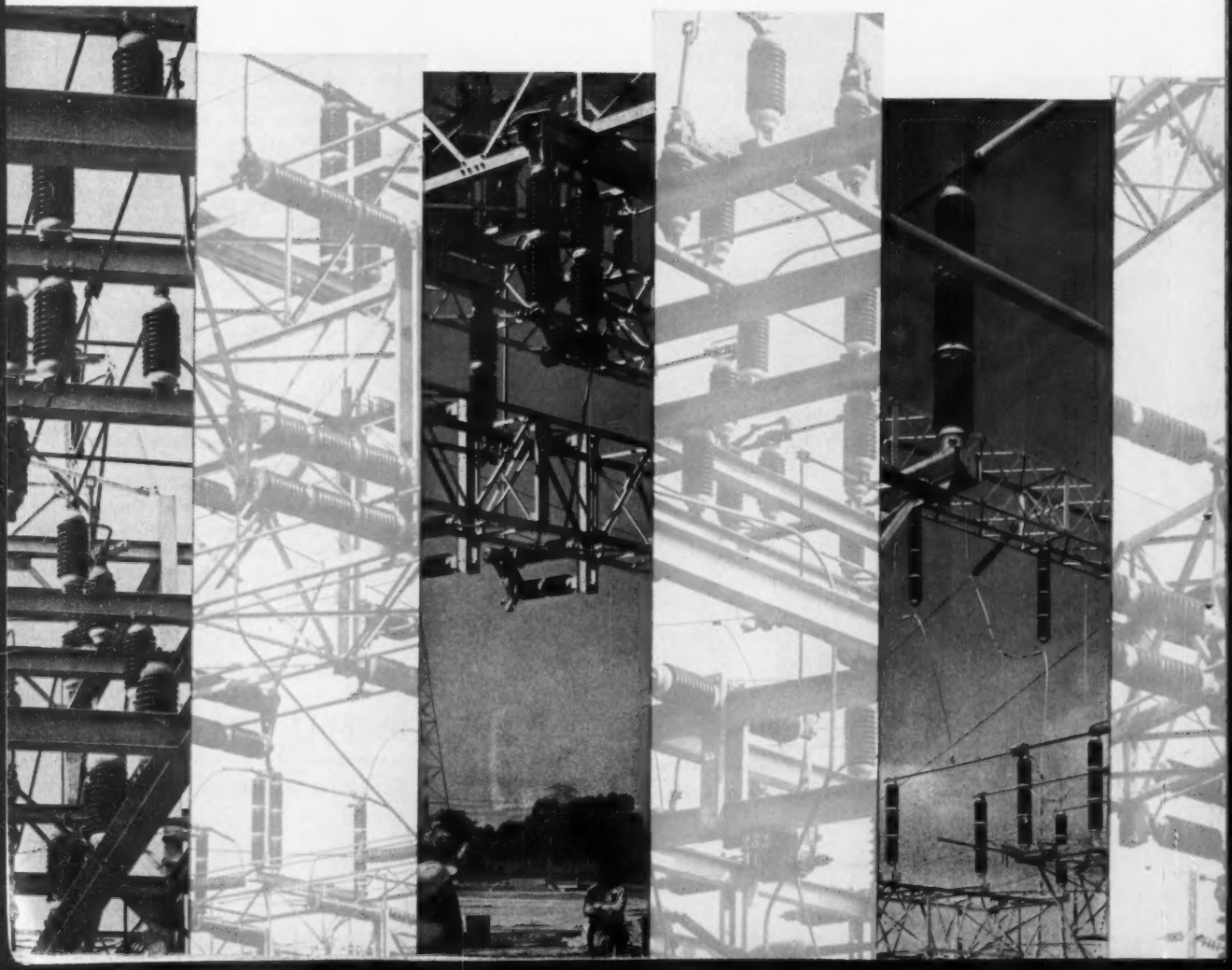
POWER PIPING DIVISION · THE M. W. KELLOGG COMPANY

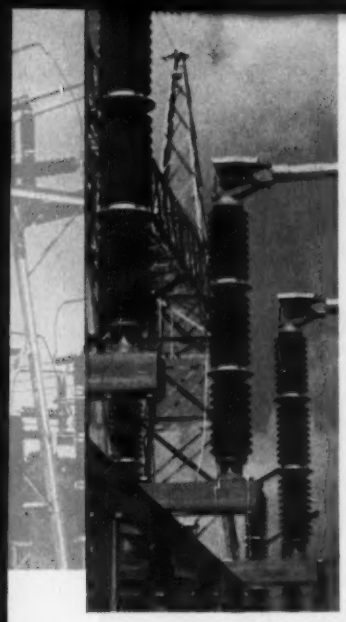
711 THIRD AVENUE, NEW YORK 17, N. Y. • A SUBSIDIARY OF PULLMAN INCORPORATED

Offices of Kellogg subsidiary companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires.

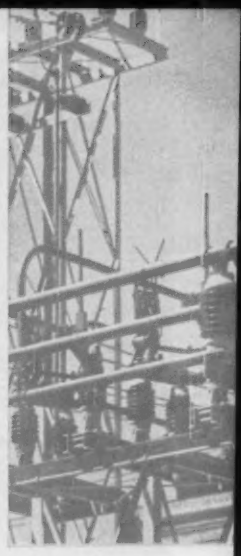


When you design with Lapp Station Posts....

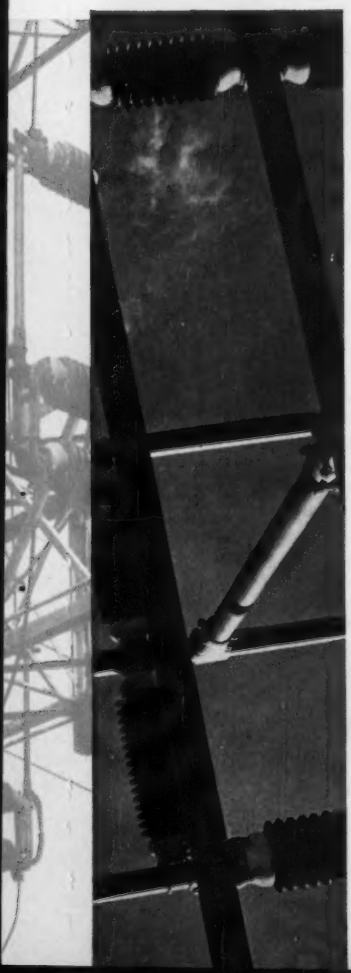




Voltage Rating kv	BIL, kv	Cantilever	Strengths	lbs.
7.5	95	2,000	4,000	8,000
15	110	2,000	4,000	8,000
23	150	2,000	4,000	8,000
34.5	200	2,000	4,000	8,000
46	250	2,000	4,000	8,000
69	350	1,500	4,000	6,000
115	550	1,700	2,900	4,000
138	650	1,450	2,450	3,900
161	750	1,200	2,000	3,500
	900	910	1,450	2,750
	1050	750	1,170	2,300
	1300		1,000	2,000
	1470		900	1,750
	1645		770	1,550
	1800		680	1,400



.....you can have what you want in BIL, in strength, in stiffness



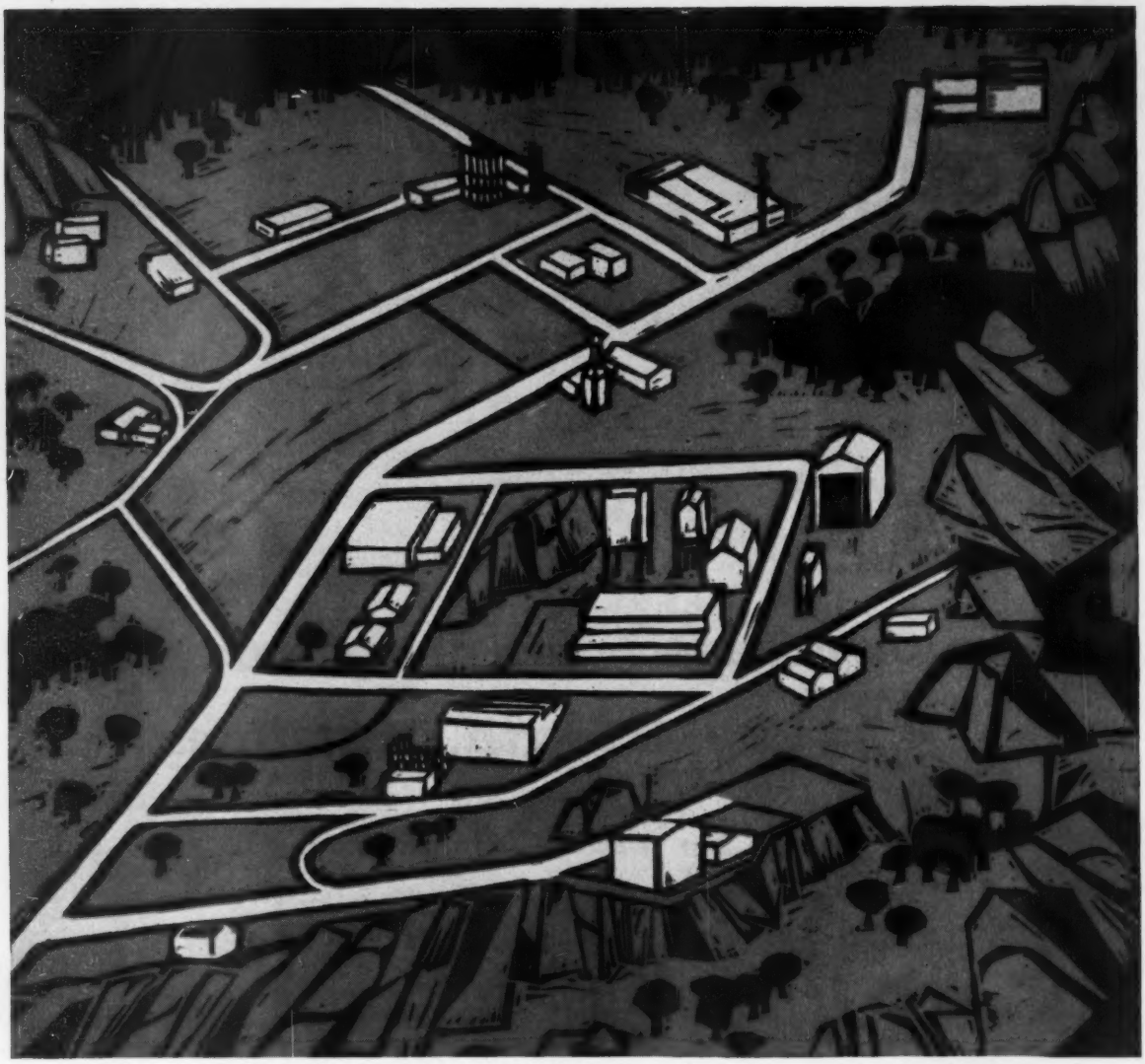
Use of Lapp Station Posts frees designers of modern substations from the need to design around characteristics—and shortcomings—of conventional switch and bus insulators.

The family of Lapp Station Posts is a "modular series" which gives widest range of insulation levels *and* strength ratings. Station Posts are smaller in diameter, too . . . lighter in weight . . . stiffer . . . easier to assemble; and they're suited to mounting horizontally, underhung or angled . . . available in strengths greater than have ever been offered in conventional pin-cap units.

Stations on Lapp Station Posts require less real estate, less steel work. And, because their performance is better under all electrical conditions and mechanical loading, they need less maintenance too. You should have the whole story. You can read it in the new Lapp Catalog No. 8. If you haven't a copy, we'll be glad to send one.

Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp



AI's extensive field laboratory is located in California's Santa Susana Mountains. *Woodcut by Edward Kysar.*

How can A.I. facilities help you plan a Nuclear Program?

In the picturesque Santa Susana mountains near Los Angeles, Atomics International has built an extensive field laboratory for research, engineering and testing in the nuclear sciences. Here, and at a headquarters complex in the valley below, men who pioneered the creative uses of atomic energy are applying their experience to develop advanced nuclear reactors and associated equipment.

Fourteen years of experience in developing various types of reactors for the Atomic Energy Commission and other organizations have given the men of Atomics International a collective background unparalleled in the industry. The facilities at their disposal are among the most sophisticated and extensive in the world.

Results of AI's work have been demonstrated in projects for the AEC which include the Organic Moderated Reactor Experiment at the National Reactor Testing Station in Idaho and the Sodium Reactor Experiment at the company's field laboratory. Additionally, AI built and is operating SNAP II, a 220 pound prototype reactor to produce three kilowatts of electricity for space vehicles.

Atomics International is also building large power reactors for electric utilities in Ohio and Nebraska under AEC programs. Studies are underway for other power reactors in the United States and Europe. Research reactors have been built by AI for Denmark, Germany, Italy, Japan, Puerto Rico and several sites in the United States.

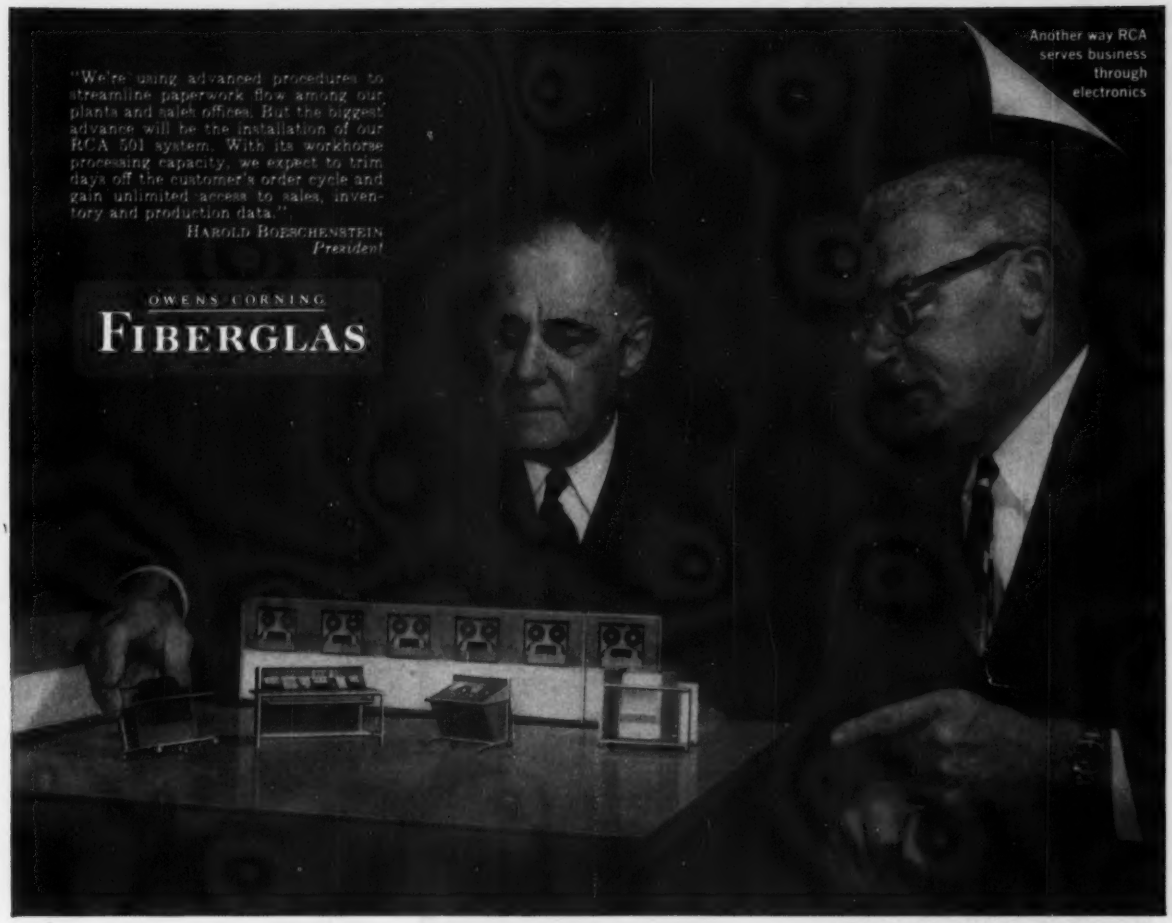
For details contact: ATOMICS INTERNATIONAL, Canoga Park, California, U.S.A. Cable address: ATOMICS.

ATOMICS INTERNATIONAL

A DIVISION OF NORTH AMERICAN AVIATION, INC.

PIONEERS IN THE CREATIVE USE OF THE ATOM

Other offices in: Washington, D.C., U.S.A.; Geneva, Switzerland. Affiliated with: INTERATOM, Bensberg/Cologne, Federal Republic of Germany and DYNATOM, Paris, France.


"We're using advanced procedures to streamline paperwork flow among our plants and sales offices. But the biggest advance will be the installation of our RCA 501 system. With its workhorse processing capacity, we expect to trim days off the customer's order cycle and gain unlimited access to sales, inventory and production data."
HAROLD BOESCHENSTEIN
President
OWENS-CORNING
FIBERGLAS
Another way RCA serves business through electronics

Left to right: Harold Boeschenstein, President and H. M. Cranston, Comptroller, Owens-Corning Fiberglas

"We do the thinking and the RCA 501 does the work"

To handle its tremendous load of paperwork, Owens-Corning Fiberglas has ordered an RCA 501—the world's most modern electronic data processing system. Linked to a 12,850-mile Teletypewriter network, this system will receive information directly from sales offices and manufacturing plants and handle order processing, invoicing, sales analysis, inventory control, and eventually production scheduling.

Owens-Corning selected the RCA 501 for several important reasons. First of all, the RCA 501 offers speed. It can handle each application in a highly efficient manner and at a remarkably low cost per unit of work. Secondly, the system can be expanded as needed. Owens-Corning is starting with a basic system, to which units may be added as more capacity becomes needed. Thirdly, the all-transistor construction of the RCA 501 helps cut costs by drastically reducing size and weight as well as power and cooling requirements.

For full information about the RCA 501 and its advantages to your business, visit the RCA 501 Electronic Data Processing Center at Cherry Hill (near Camden, New Jersey). To arrange a visit to the center, address RADIO CORPORATION OF AMERICA, Electronic Data Processing Division, Camden 2, New Jersey.

At the world's most modern Electronic Data Processing Center in the RCA-Cherry Hill plant near Camden, N. J., the RCA 501 may be seen in full-scale operation serving business, industry and government.

RCA 501

ELECTRONIC DATA PROCESSING SYSTEM

RCA Tmk(s) ®

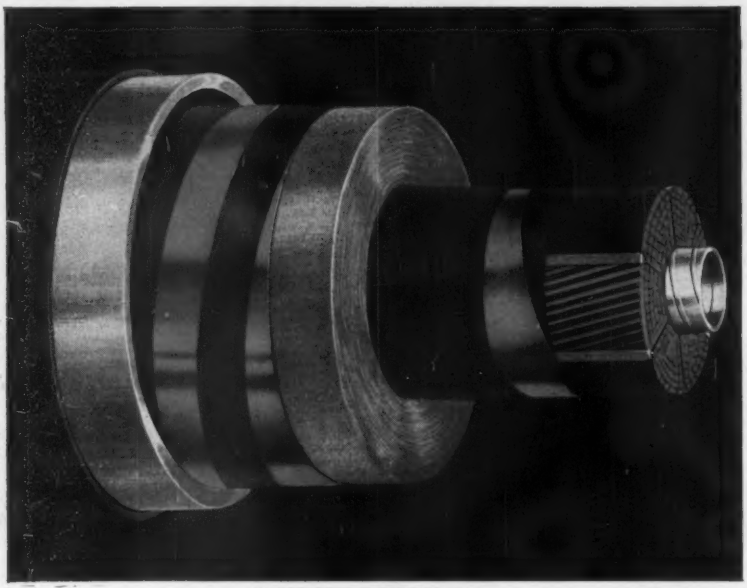
RADIO CORPORATION of AMERICA

ELECTRONIC DATA PROCESSING DIVISION • CAMDEN 2, N. J.

DEVELOPED FOR JOINT AEIC-EEI HIGH VOLTAGE CABLE PROJECT AT CORNELL UNIVERSITY...

New Phelps Dodge High Pressure Oil-filled 345 KV Cable System

Combines the advantages of low pressure oil-filled cable with those of pipe-type cable



Phelps Dodge Copper Products Corporation has designed a completely new 345,000 volt high pressure, oil-filled power cable for a special high voltage project being sponsored jointly by the Association of Edison Illuminating Companies and the Edison Electric Institute. The test project will be conducted by the Electrical Engineering Department of Cornell University's School of Engineering at Ithaca, N. Y. Three other leading American cable manufacturers are also submitting cable systems for the project.

Objectives of Project

The AEIC-EEI project has two main objectives. Primarily, it is aimed at developing the most practical cable systems for economically transmitting huge blocks of electric power—particularly in the extra-high voltage ranges that American utilities will have to handle in the near future. The project is also intended to

CABLE SPECIFICATION

Voltage	345 Kv.
Rating	500 Megawatts
Load factor	90%
Loss factor	85%
Installed in concrete duct, spacing, center to center	9 in.
Ambient earth temperature	25°C
Conductor temperature, normal	75°C
emergency	90°C
Nominal shipping length	1000 ft.
Cable construction	
Steel spiral hollow core I.D.	0.69 in.
Six segment compact segmental conductor	2000 MCM
Graded 1 to 6 mil wood pulp paper insulation	1035 mils
Seamless tubular aluminum sheath	220 mils
Extruded high density polyethylene jacket	120 mils
Overall diameter	4.68 in.
Nominal operating pressure	200 psig.
Joints	Mechanical
Potheads	Condenser type
Oil Supply	Central pumping plant

TESTING SPECIFICATION

Power factor at 90°C	below 0.25%
Power factor at 100°C	below 0.30%
Ionization factor	Minimum
Sixty cycle voltage tests to ground	
Full reel	300 Kv.
Sample withstand tests,	
6 hour	373 Kv.
one minute	680 Kv.
Impulse withstand voltage test to ground (1½ x 40)	
at 75—90°C with splice	1175 Kv.
At ambient with potheads	1300 Kv.
Load cycle test, 290 Kv. to ground, 110°C copper	Stable

This "production line" was set up to fabricate cable in Phelps Dodge plant. Note oversize reel in background.

demonstrate the ability of American cable manufacturers to design and fabricate power cables with ratings of 345 KV and up. It is hoped, too, that the project will serve to stimulate interest in this field among student engineers.

Phelps Dodge's decision to design an aluminum-sheathed, high pressure, oil-filled cable to carry as much as 345 KV was based upon careful consideration of the project and a thorough exploration of all feasible materials. The comprehensive knowledge and extensive experience of Phelps Dodge in this highly specialized field, together with the ultra-modern research facilities available to Phelps Dodge engineers, played a major part in determination of the final cable design.

Combined Advantages of Cable

This design combines desirable features of the pipe-type cable with those of the low pressure oil-filled cable. In appearance, the aluminum sheathed cable is like the conventional oil-filled cable, but, like a pipe-type cable, it is operated at an oil pressure of 200 psi., using a small oil pump system equipped with oil treating accessories.

Thus the cable has the features of a pipe-type cable, enabling long lengths to be installed, together with the insulation security due to high pressure, and the ability to freeze the oil for repairs of buried cables.

It also has the advantages of a low pressure oil-filled cable, including complete protection of the insulation from air and moisture, ability to be used in a duct system, and absence of conductor size limitation from the magnetic effects of steel pipe.

A distinctive part of this Phelps Dodge cable is a special paper insulation developed after intensive evaluation studies in a paper laboratory set up by Phelps Dodge for this project. The new paper uses carefully selected pulps made with filtered and de-ionized water. A newly developed commercial oil, resulting from Phelps Dodge's continuous 30-year oil research program and close liaison with a petroleum company, is another unusual part of the cable system.

Prototypes Built

Phelps Dodge engineers first fabricated several full scale prototypes of the cable by building in progressive stages to 161,000 volts, 230,000 volts and, finally, 345,000 volts. These prototypes then were thoroughly tested in Phelps Dodge's modern high voltage research laboratory with impulse voltage, accelerated aging load cycle and 60-cycle extra-high voltage tests. The cable and joint were also given a manhole bend test. Because of the extremely high voltage of the cable, new types of high pressure condenser potheads were developed by two accessory manufacturers in collaboration with Phelps Dodge engineers.

At Ithaca, all the cables in the project will be placed underground in applications that will simulate, as nearly as possible, actual in-service conditions. During the project these same in-service conditions will be maintained as closely as environment allows. All cables will be subjected to high voltage measurements periodically with close cable monitoring to record performances.

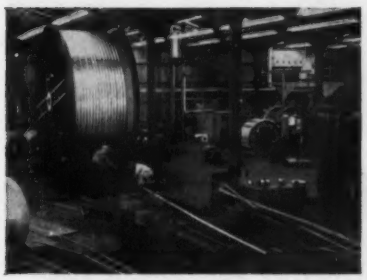
The development of this new 345 KV cable system is another tangible result of Phelps Dodge's thorough knowledge and pioneering research, supplemented by close contact with the latest European advances in the electric power transmission field. It illustrates why Phelps Dodge enjoys a reputation for progressive leadership in modern power cable fabrication.

PHELPS DODGE COPPER PRODUCTS

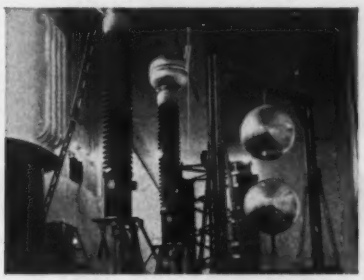
CORPORATION

300 Park Avenue, New York 22, N.Y.

PD

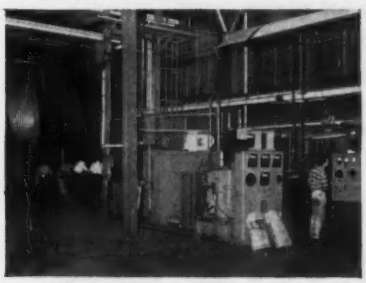


Aluminum sheath is swedged over cable prior to placing cable on mammoth 19-foot reel.



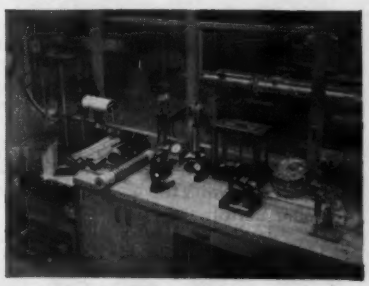
Exacting high voltage tests are applied to 345 Kv. cable system in Phelps Dodge high voltage research laboratories.

Sixty-Cycle Power Factor Laboratory, where components were given electrical tests.



Final step was extruding polyethylene outer jacket over 345 Kv. cable.

Prototype cable and joint undergo manhole bend test in Phelps Dodge laboratories at Yonkers, N. Y.



Special Paper Test Laboratory played important role in development of cable insulation.

IT'S A PUSHOVER!

Pull a lever and your digger moves *sideways*... nuzzles up close to the pole . . . and bores a straight hole. That is if it's a Holan 6800 Derrick with an earth borer equipped with the new transverse positioning cylinder.

"Pushing over" the earth borer enables the operator to bore at curbside with the truck parked at a slight angle—thus eliminating the blocking of traffic.

From the centerline of the derrick, the new transverse positioning cylinder will move the digger 11″ to the left side and 29″ to the right or curbside. This sideway travel permits the operator to bore a hole close to any obstruction.

The new transverse positioning cylinder is a perfect working companion of the "fore and aft" or longitudinal positioning cylinder which has helped the Holan 6800 Derrick achieve an enviable record for workhorse versatility. With both positioning cylinders you reduce truck maneuvering when spotting hole sites, maintain straight line feed when boring, bore anchor holes without repositioning truck, and start holes faster in rough and uneven terrain.

Holan's transverse positioning cylinder adds a new dimension to digging. Call or write today for more information.

Holan Corporation, 4100 W. 150th St., Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Ariz.

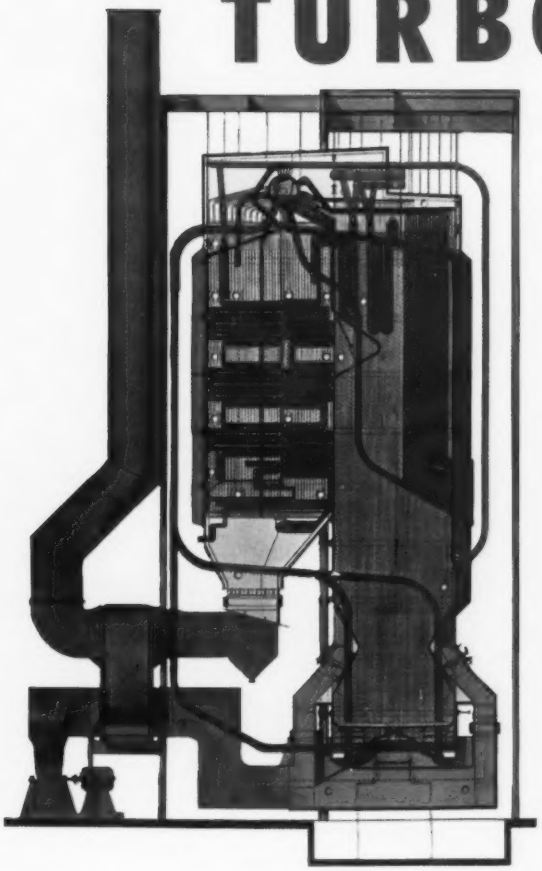
Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

Your Answer to Full Fuel Utilization in the '60's...

...RILEY Boilers With The TURBO FURNACE



Any fossil fuel can be fired in a Turbo Furnace singly and in any combination. Advanced operating and performance characteristics represent important strides in the art of fuel burning and steam generation. In recent years the Riley Turbo Furnace Boiler, a relatively new concept of boiler-furnace design, has been widely accepted by public utilities, manufacturing industries and their consulting engineers.

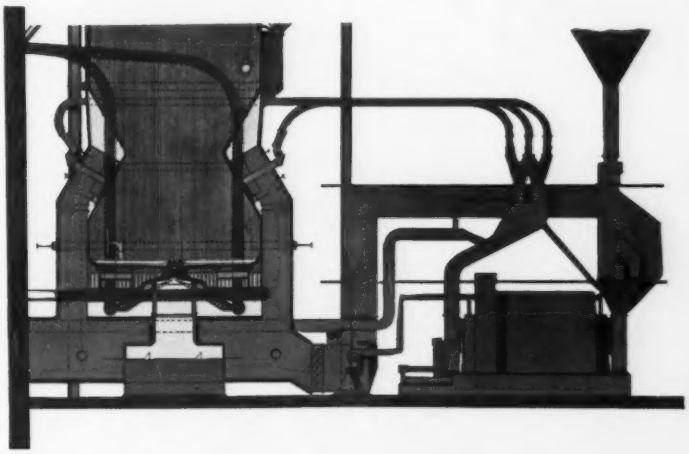
Turbo Furnace Boilers now in operation and under construction range in size from industrial type installations to high capacity central station units. Many Turbo Furnace Boilers are pressurized. Some are designed to fire coal, oil and gas separately or in any combination depending on B.T.U. cost of fuel.

Coal fired Turbo Furnace Boilers have these advantages: the elimination of the problem and cost of flyash disposal, the elimination of slag blowers, the ability to tap slag through a wide load range. Four Turbo Furnace Boilers are successfully firing fluid coke, which is handled as a pulverized fuel.

Many boilers of this design were purchased in anticipation of a changing fuel market because the design offers a simple low cost means of transition from one fuel to another.

The 1,650,000 lb/hr Turbo Furnace reheat boiler design for Louisiana Power and Light Company's new Little Gypsy Steam Electric Station . . . pioneer in complete automatic operation. Boiler operation at 2350 psig, 1005 F. superheat, reheat; pressurized.

Because the basic design of the Riley Turbo Furnace Boiler is suited to firing a wide variety of fuels, a boiler initially installed to burn oil and gas requires little alteration to equip it to burn pulverized coal. The design at right is a boiler originally installed for oil and gas. Many of the provisions for pulverized coal firing are accomplished externally while the boiler is kept in service on oil or gas.



A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

Here Are Some Desirable Characteristics You'll Find In A Riley Turbo Furnace Boiler

Simplified Steam Temperature Control

Performance varies little with type and grade of fuel being burned. Furnace exit temperature is lower than for horizontally fired boilers of equal heat release rates because heat absorbing surfaces are used more effectively. This simplifies steam temperature control.

Reduces Flyash Problems

Reinjection of flyash and continuous molten ash discharge eliminate costly flyash collection and disposal problems. Flyash combustible losses are eliminated. Some installations receive flyash from adjacent dry bottom units for disposal in the Turbo Furnace.

Reduction of Air Pollution

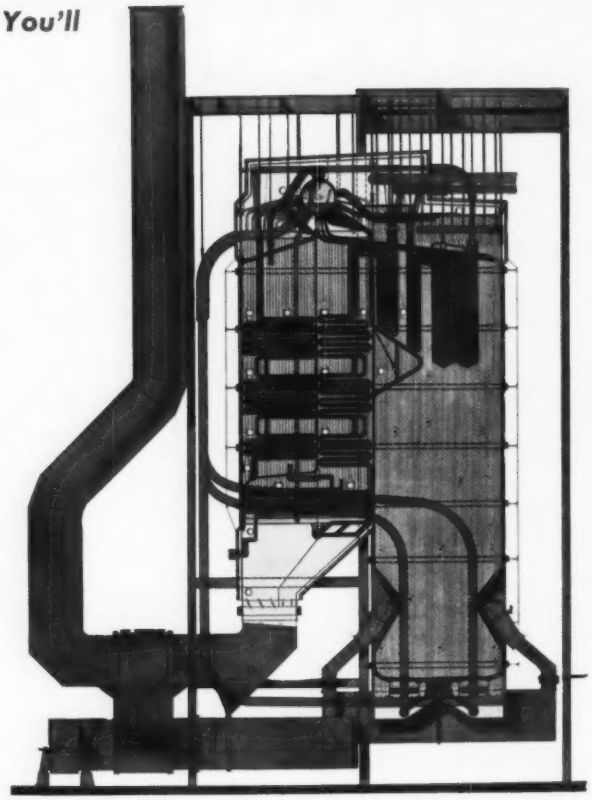
Because of the burning method, flue gases contain lower quantities of objectionable oxides of nitrogen.

Continuous Slag Tapping At Low Loads

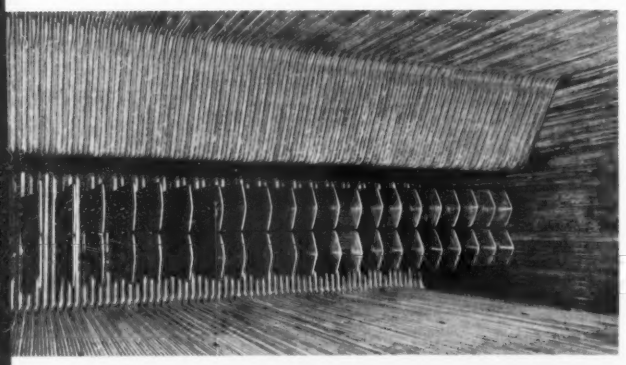
Burners are directed downward and fire on the floor around the tap hole assuring tapping at low load operation and making possible the use of higher fusion coals. Continuous flow of slag has been obtained at 25% of maximum continuous rating.

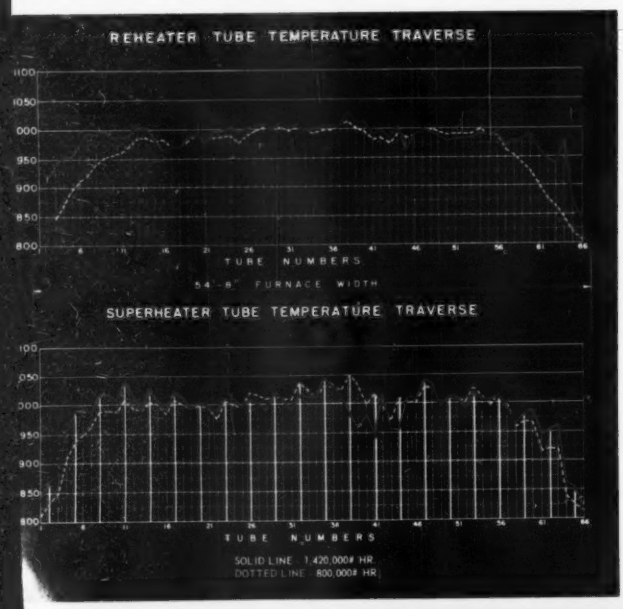
No Furnace Wall Deslaggers are Normally Required

Because of high ash retention in the bottom and the uniform vertical gas flow pattern furnace wall slagging is substantially eliminated.



The 1,550,000 lb/hr Turbo Furnace Boiler at Louisiana Power & Light Company's Sterlington (La.) Steam Electric Station, 2125 psig, 1005/1005 F pressurized. At left—View across 55 foot wide furnace at superheater elevation.





Higher Heat Releases Permitted

The fuel is burned within the Turbo Furnace bottom, just above the Turbo Furnace floor . . . the entire furnace wall area is available for heat recovery. The nominal heat release may thus be higher than for horizontally fired boilers.

Lower External Structure Cost

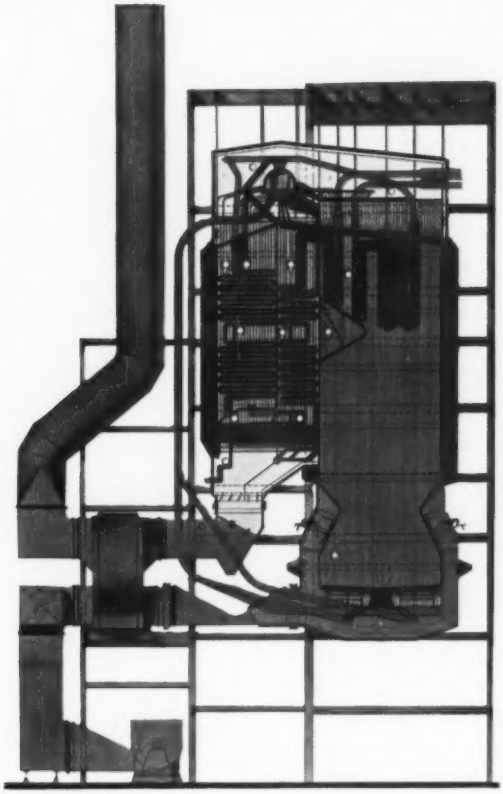
With lower furnace heat releases permitted the Riley Turbo Furnace boiler occupies less cubical space. One burner level eliminates platform and ladder construction costs.

Wider Single Furnace Boiler Units Permitted

Furnace design, combined with the opposed method of firing, controls gas flow pattern to remove limitations on furnace widths inherent with other methods of firing. Gas temperature traverses at the furnace exit are extremely uniform.

Minimum Metal Temperature Variations Due To Uniform Gas Flow

The view at left and chart are of the 55 foot wide single furnace of the 1,550,000 lb/hr unit above. Furnace has no division walls or platens. The chart shows the uniform metal temperature gradient of superheater and reheater tubes spaced across the width of the furnace. The maximum variation above the normal 1005 F is well within safe limits assuring long metal life. The chart also shows the same uniform pattern for lower loads.

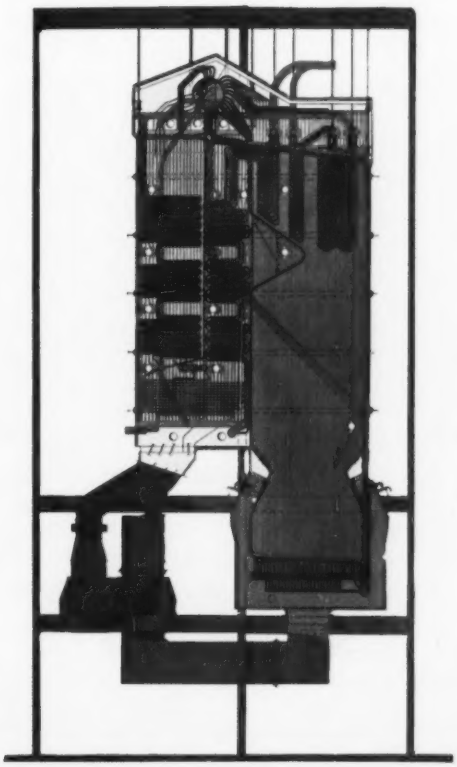


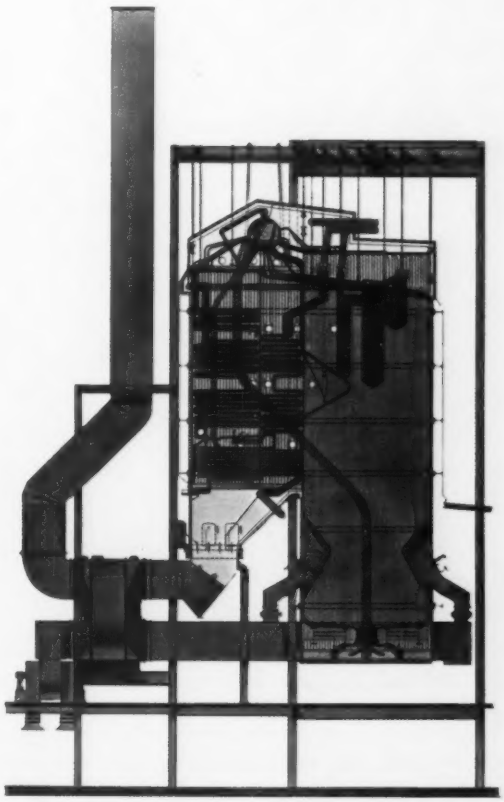
TYPICAL RILEY TURBO FURNACE BOILER INSTALLATIONS

At left — North Lake Steam Electric Station, Dallas Power & Light Company. 1,200,000 lbs/hr — 2125 psig, 1005/1005 F with pressurized Turbo Furnace. Fired by natural gas and oil.

Lower left — Turner Unit No. 4, Florida Power Corporation. 600,000 lbs/hr—1650 psig, 1000/1000 F. Fired by oil and natural gas.

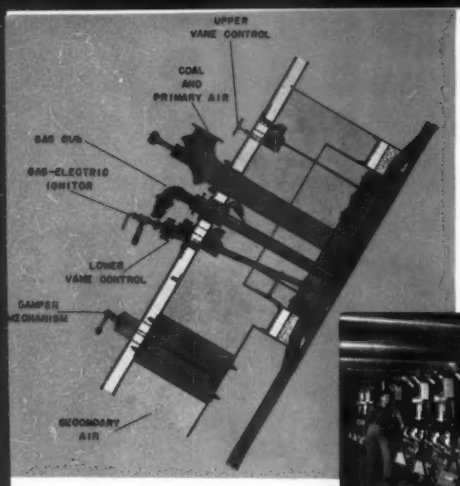
Below — Permian Basin Steam Electric Station, Texas Electric Service Company, 825,000 lbs/hr, 1750 psig, 1005/1005 F. pressurized. Fired by natural gas, oil, (Future pulverized coal).





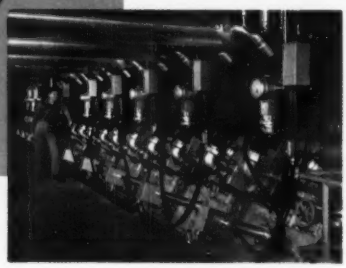
RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

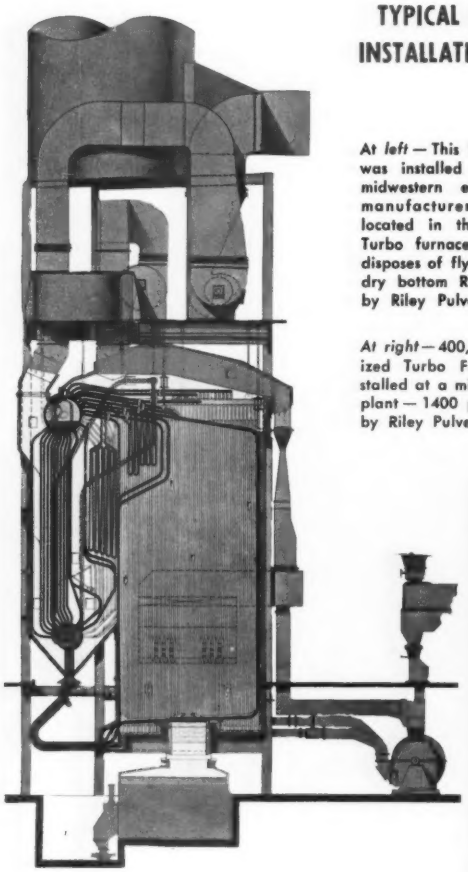


Turbo Furnace Burner Maintains Stable Flames Over Wide Load Ranges.

Riley Directional Flame Burners are designed expressly for the Turbo Furnace to burn gas and oil and pulverized fuels that are burned in suspension such as coal, lignite, fluid coke, delayed coke, etc. Burners are arranged for opposed firing on one level. Fuel and combustion air are introduced thru openings between furnace wall tubes. There is no exposed refractory to maintain. Directional vanes control placement of flame. Turn down ratio for gas is limited by gas flow control system; minimum load for oil is limited only by oil atomization (7 to 1 ratios have been attained). Stable flames with coal firing are easily maintained on a 5 to 1 load ratio.

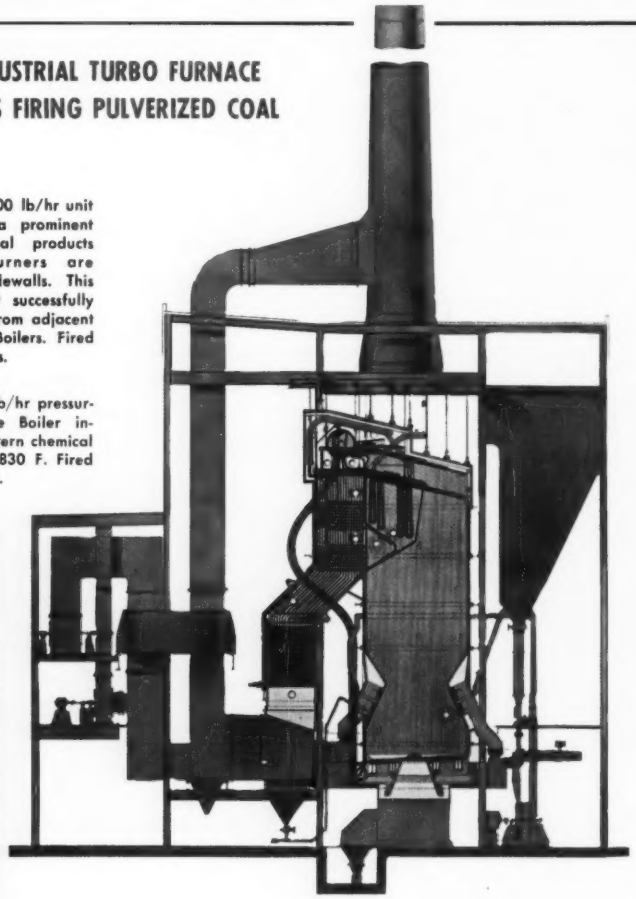


TYPICAL INDUSTRIAL TURBO FURNACE INSTALLATIONS FIRING PULVERIZED COAL



At *left* — This 150,000 lb/hr unit was installed by a prominent midwestern electrical products manufacturer. Burners are located in the sidewalls. This Turbo furnace Unit successfully disposes of flyash from adjacent dry bottom Riley Boilers. Fired by Riley Pulverizers.

At *right* — 400,000 lb/hr pressurized Turbo Furnace Boiler installed at a midwestern chemical plant — 1400 psig, 830 F. Fired by Riley Pulverizers.



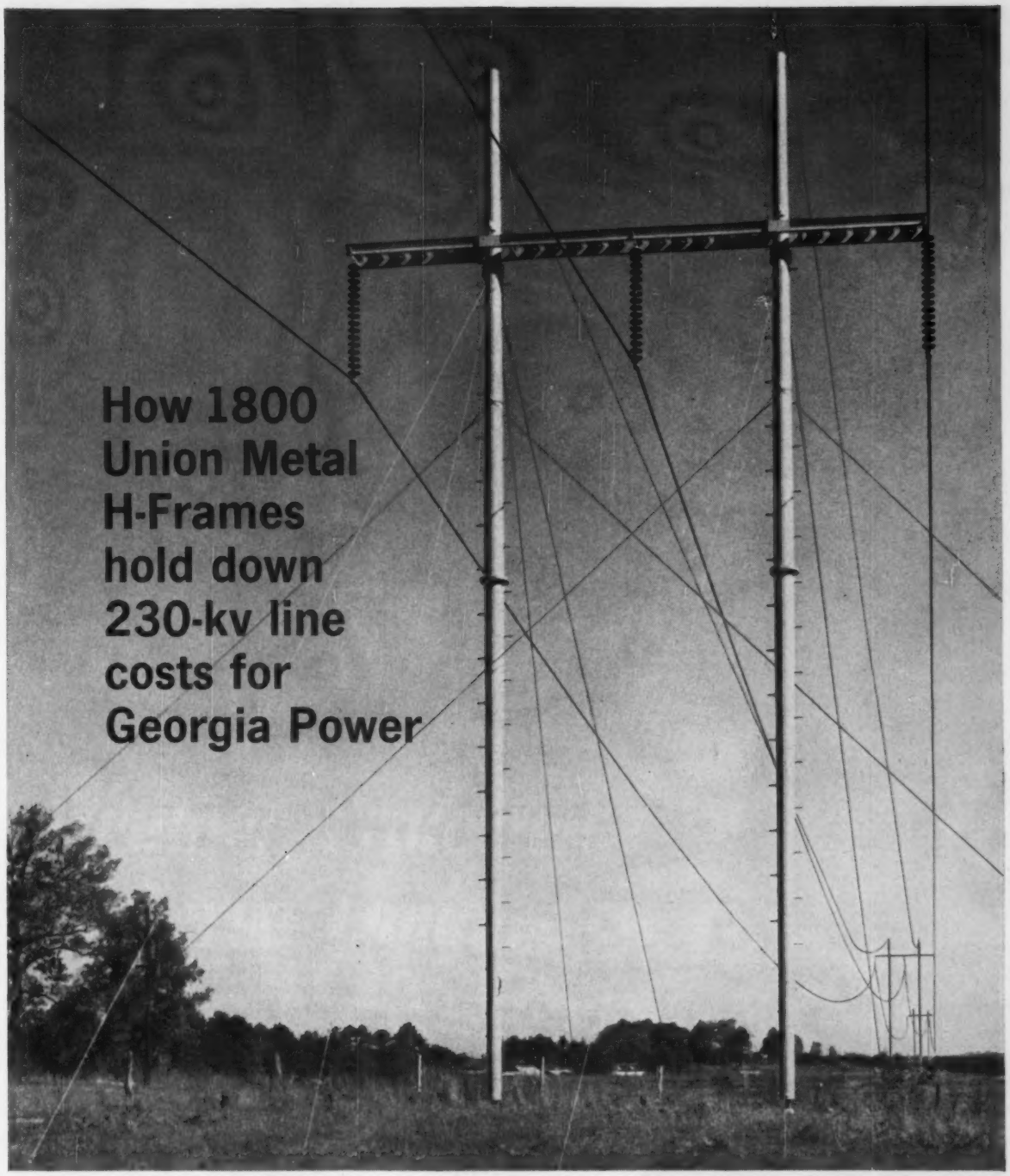
Ask your Riley representative for detailed information about Riley Turbo Furnace Boilers — or write direct to RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS.

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

SALES OFFICES

Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Salt Lake City, San Francisco, Seattle, St. Louis, St. Paul, Syracuse.

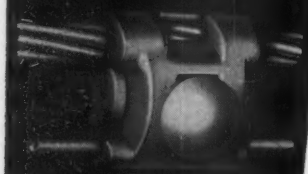


Reasons why Georgia Power Company installed Union Metal Monotube steel structures on 475 miles of 230-kv line: simplified line engineering; suspension type crossarm advantages; light weight minimizes transportation, handling and erection expense; complete ground assembly increases number of structures set per day; inexpensive precast concrete foundationing; multiple line requirements are met with a few standardized parts; height flexibility reduces number of structures per mile; ample strength to meet wide loading range; major maintenance savings and longer life; pleasing appearance. Information upon request.

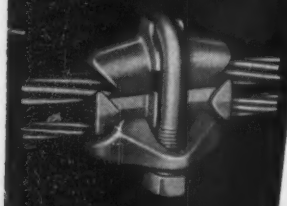
The Union Metal Manufacturing Company
Canton 5, Ohio **Brampton, Ontario**

UNION METAL
Monotube Transmission Line Structures

Type HT

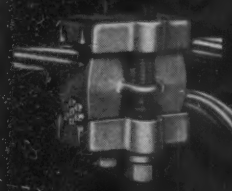


Type PAA



Type DLC

Type W



Type 2A

Type CS

There's a BLACKBURN clamp for every ALUMINUM CONNECTION

Always Use Blackburn Aluminum Fittings When Terminating or Joining Aluminum Conductors

- Each clamp accommodates a wide range of conductors.
- Castings are high-strength, corrosive-resistant, heat treated aluminum alloy.
- Blackburn special surface treatment eliminates production oxides and improves conductivity.
- Bell contoured grooves protect conductors. Clamping forces are distributed over extra-large contact area.
- Available with galvanized steel or aluminum hardware. Aluminum hardware is alumilited to prevent seizing.
- Can be quickly and easily installed with regular linemen's equipment. No special tools required.

IMPORTANT: We recommend the use of CONTAX on all aluminum connections. CONTAX is an oxide inhibiting compound with an ASTM drop point of 549° F.

BLACKBURN *Aluminum* FITTINGS

JASPER BLACKBURN CORPORATION
1525 WOODSON RD., ST. LOUIS 14, MO.
WYdown 3-9430

RT&E Transformers

Weather Protected to Serve Longer

Like the postman, neither rain nor snow, nor hail, nor salt spray can prevent R T & E Transformers from doing their duty. Here's proof that every R T & E unit is completely "WEATHER PROTECTED."

- **FINISH:** Three coats of modified Alkyd paint for all season protection.
- **DESIGN:** Domed cover for immediate water run-off.
- **TANK:** Arc-welded seams and absence of lip on tank bottom mean no moisture collecting cracks and crevices.
- **BUSHINGS:** HV bushings internally clamped — no external clamps and bolts to corrode.

Plus stainless steel cover band to eliminate corrosion on accidentally scratched areas . . . stainless steel threaded mounting pads . . . all unpainted fittings either galvanized or electro-tinned.

R T & E "Weather-Protected" Transformers last longer, require less maintenance, serve better all year 'round.

Equipment to help provide power for America.

R T & E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

Here are answers to some about KPF switches

Q. *How can KPF switch blades maintain positive contact with switch clip under changing line sag conditions?*

A. Two heavy copper clips, bolted to a shoe carrying the flexible jumper, are mounted inside a special "horseshoe shaped" casting by two toggle bolts. These toggle bolts pass freely through the outer leaves of the clips, and the entire contact assembly "floats" on these bolts. Half-spherical bolt heads and adjusting nuts permit movement in any direction. The tension of the clip leaves on the blade is sufficient to insure positive alignment, since either clip or blade can follow the other to conform to line sag changes.

Q. *How can insulator stacks follow normal line sag changes?*

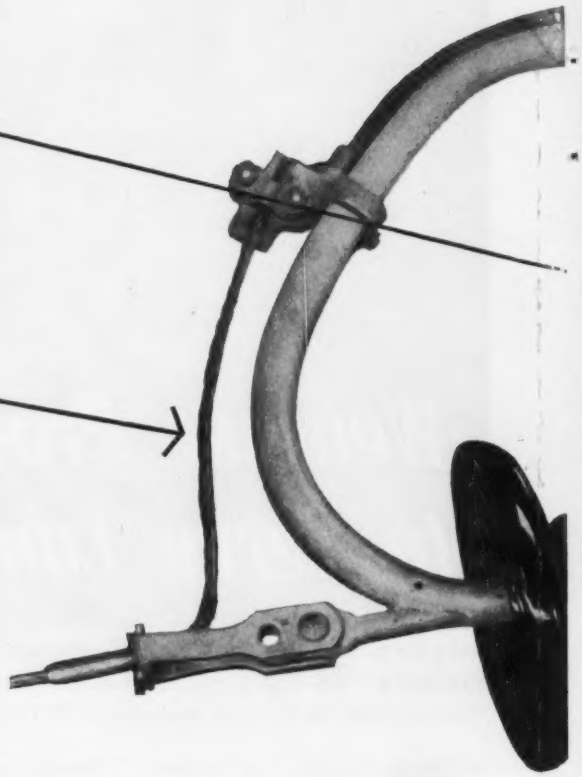
A. The insulator stack bearing units may be likened to limited universal joints. The actual bearing, a monel pin in an everdur trunnion, allows 90° movement of the rotating arm of the phase unit, as well as approximately 7° vertical movement to follow line sag. It is impossible for the bearing to bind under normal line stress, and insulator stacks always follow the sag of the conductor.

Q. *How are conductors connected to KPF switches?*

A. With KPF Type A switches, the user eliminates dead-end insulators. Any standard strain clamp can be used, and hot lines may be dead-ended directly to the phase units. Switch arms and dead-end eyes are integral with the insulator assembly. The conductor is lead through the strain clamp and on to a copper terminal on the switch arm. Aluminum conductors may be connected to the switch arm through special KPF terminals designed for this service. Type A switches may be mounted on a separate crossarm with conductors deadened below or above (for angle-pole installations, etc.). Switch operates equally well with or without line tension.

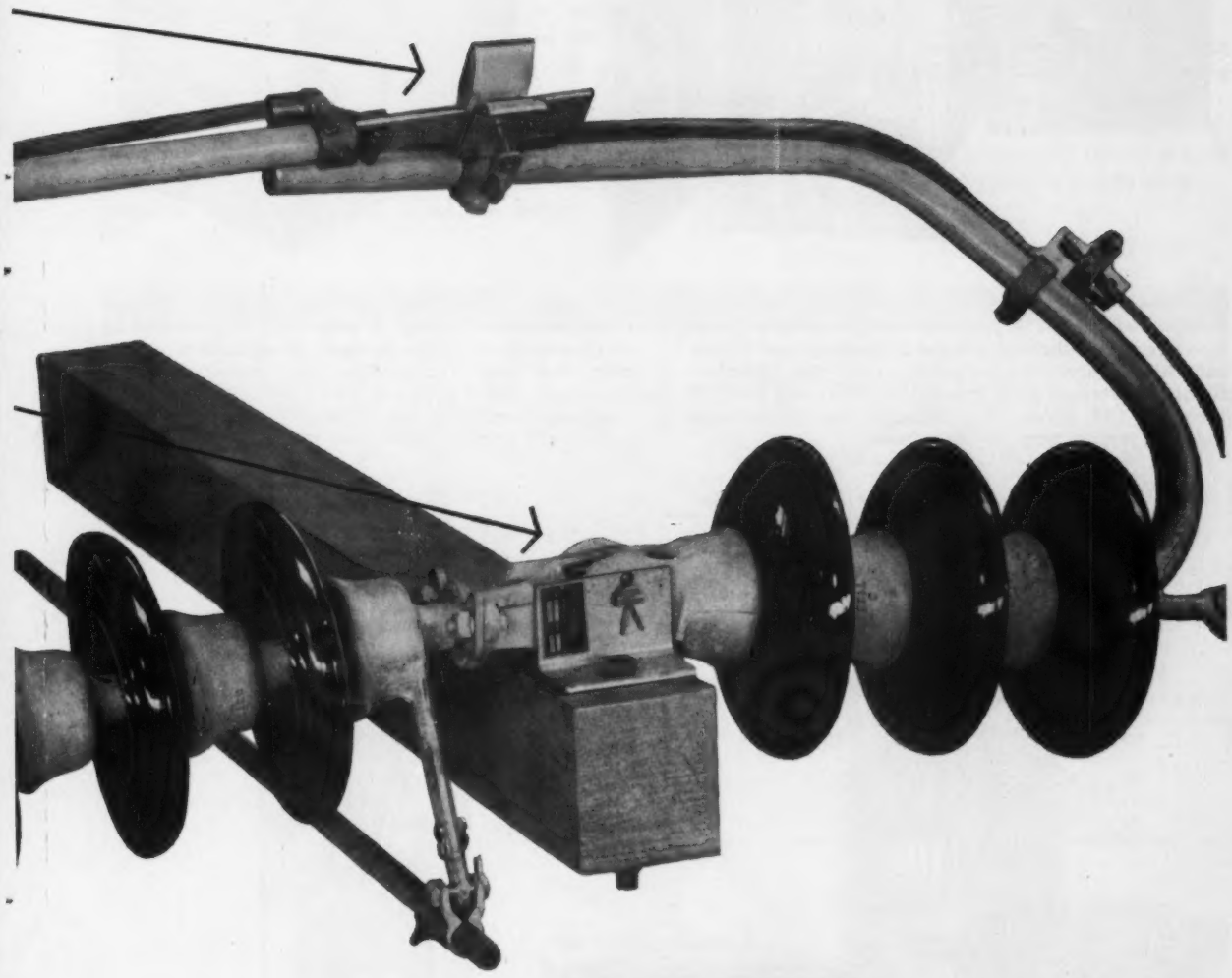
Q. *For what voltages are KPF air break switches available?*

A. KPF Type A and S standard "line-tension" switches are available for common voltages from 7.5 to 110 KV. Special switches combining a disconnect with a fuseholder (Type UF, double-cross-arm mounting) and for use where line tension is not present are also offered in these same voltage ranges. Ground switches are available for Type A or S switches. Type R switches are offered for use where line tension is not present or it is desired to use a specific type of apparatus insulator.



Request Catalog or write for details.
Test on your system this month!

often-asked questions



KPF

AIR BREAK SWITCHES

Standard for half a century

KPF ELECTRIC COMPANY

P. O. Box 1257E • Stockton, California

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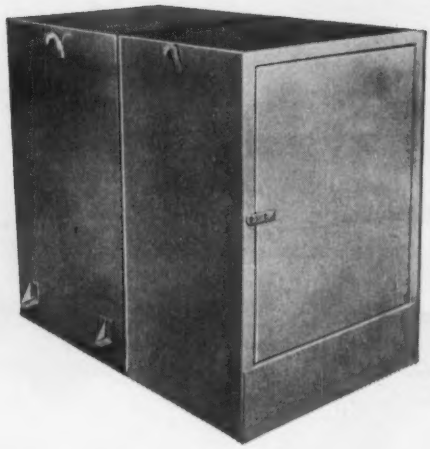
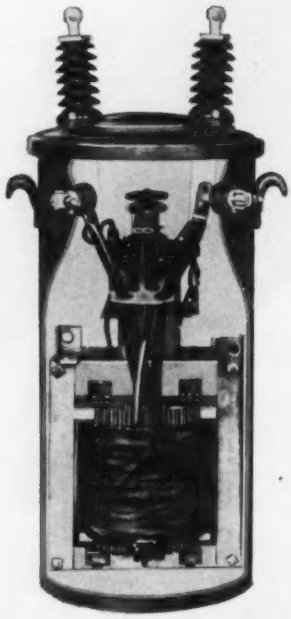
SELECTING DISTRIBU



STANDARD'S FIELD TESTED, pad-mounted unit's compartmental design permits changes in single phase transformers without a change of terminations. Standard termination compartments give you complete flexibility from 15 KVA through 50 KVA and 75 KVA through 167 KVA. You change the transformer only . . . just as you do on a pole.

You can work on the secondary side with perfect safety because the high voltage side is protected by an inside door. Outside door is equipped with a hasp and lock. Performance data matches that of Standard's SWA series of pole-type units. You have complete flexibility on protection and switching equipment to meet individual preference.



EXCEPTIONAL PERFORMANCE by these SWA units has placed them on the approved lists of leading utility companies. Extremely low copper losses, low impedance and low temperature rise without excessive voltage drop put these units in a class by themselves. Your Standard representative can show you how they reduce "unaccounted for" losses on your system.

TION TRANSFORMERS

AREN'T THESE THE CONSIDERATIONS?

INCREASED VOLTAGE AT THE METER.
INCREASED OVERLOAD CAPACITY.
REDUCED COPPER LOSSES . . . and
SELLING MORE OF PRODUCED ENERGY?

Sure they are! But even more important, you have to ask yourself "What's best for MY system?"

Let's check the chart. A complete set of all ratings are yours for the asking. See how overload can be carried on the SWA without exceeding the 3% voltage drop danger line.

See how the copper loss compares with other transformers when you carry overloads.

Check the thermal time constant as a measure of overload capacity—SWA is 13 to 22% better.

The Standard SWA series of pad-mounted and pole-type distribution transformers hits these problems hard. They slash copper losses a whopping 30% at full load to help you deliver more power to the meter . . . reduce impedance to cut service complaints . . . have low temperature rise without excessive voltage drop.

These dramatic units help you SELL MORE OF THE ENERGY YOU GENERATE OR BUY. Your nearby Standard Transformer Company representative can show you how to apply these units to your system for best results. Check it out today. Get the facts from him. You'll be away ahead where it counts most . . . IN INCREASED REVENUES!

50 KVA — 2400 V. — NO TAPS

CONVENTIONAL 50 KVA WA								STANDARD 50 KVA SWA							
LOAD KVA	CORE LOSS	COPPER LOSS	TOTAL LOSS	% REG. 0.9 PF	%IZ	%IR	%IX	LOAD KVA	CORE LOSS	COPPER LOSS	TOTAL LOSS	% REG. 0.9 PF	%IZ	%IR	%IX
40	"	367	537	1.45	1.68	.92	1.41	40	"	267	437	1.00	1.12	.67	.90
50	"	575	745	1.82	2.1	1.15	1.76	50	"	418	588	1.24	1.4	.83	1.12
60	"	828	998	2.18	2.52	1.38	2.11	60	"	602	772	1.49	1.68	1.01	1.35
70	"	1125	1295	2.54	2.94	1.61	2.46	70	"	820	990	1.74	1.96	1.17	1.57
75	"	1295	1465	2.72	3.16	1.73	2.64	75	"	940	1110	1.86	2.09	1.25	1.68
80	"	1470	1640	2.90	3.37	1.84	2.82	80	"	1070	1240	1.99	2.25	1.34	1.80
90	"	1865	2035	3.26	3.78	2.07	3.16	90	"	1355	1525	2.24	2.52	1.51	2.02
100	"	2300	2470	3.63	4.21	2.3	3.52	100	"	1675	1845	2.48	2.80	1.68	2.24
110	"	2770	2940	4.00	4.63	2.53	3.87	110	"	2020	2190	2.73	3.06	1.84	2.46
120	"	3300	3470	4.35	5.06	2.76	4.22	120	"	2400	2570	2.98	3.35	2.0	2.69

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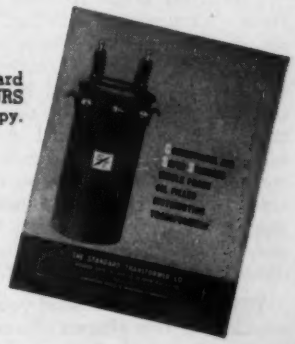

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THE HAGAN CONCEPT OF THE AUTOMATIC PLANT

The concept of an automatic power generating station is receiving thoughtful consideration in today's world of power. Profit-conscious managements, aware of the attendant risks in the headlong approach to total automation, are closely examining the hardware available today—from a standpoint of performance, experience and reliability. They are asking searching questions about their process and its performance equations—questions that must be answered before managements can determine just how far and how fast they will proceed toward the goal of a fully automated plant.

Considerations on which the Hagan Concept is based are: *payout, usage and investment.* Eventual payout must be carefully balanced against cost, since even an optimum control-computing system compromises such factors as reliability and simplicity, accuracy and sensitivity. While a "push-button" plant is feasible, the number of times the button will be pushed during the life of the unit must be considered when weighing the capital investment in equipment. And since computer capacity will stand idle until all the control loops and associated hardware are proved in action, and operators gain the necessary experience, the timing on the purchase of the computer is important.

There is a plan of action that lies between the headlong approach, with its attendant risks, and the less costly but non-productive wait-and-see viewpoint. This compromise approach is the Hagan Concept—which provides for a *logical* succession of steps towards the automatic plant, with each step a complete function.

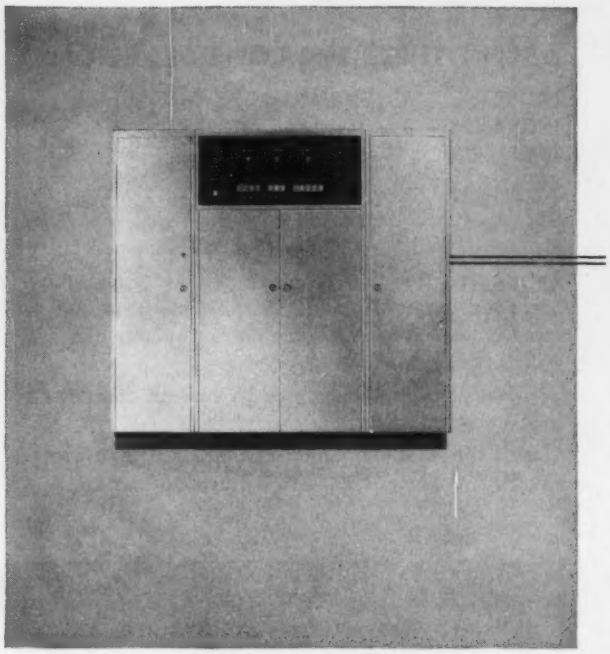
Step One: Install an analog (solid-state) electronic control system. This will take advantage of the proved reliability of analog-type control elements for actual plant operation, and will provide a workable foundation for proceeding to the next step. Maximum reliability is provided by an electronic control system utilizing magnetic amplifiers. Economy is achieved by utilizing compact remote control stations that hold panel space to a minimum.

Step Two: Install a scanning-logging system (solid-state). This can be done simultaneously with Step One. Obviously the data system must be compatible with the control system to gain economy of installation and operation.

The final steps toward complete automation—"computing facilities," "utilizing available processed data," "optimalization of the analog control loops," and "complete programming for automatic start-up and shut-down"—should be taken after start-up and commercial operation of the plant is accomplished. Anticipated 99% reliability of computer facilities is not good enough for continuous commercial operation. When based on actual plant operating experience, and when all final actuating devices have been proved reliable, programming for automatic start-up and shut-down can proceed intelligently and soundly.

We will be glad to send you a more complete exposition of the Hagan Concept. Write or phone Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30, Penna. Phone: WAlnut 2-3737.

HAGAN SOLID-STATE



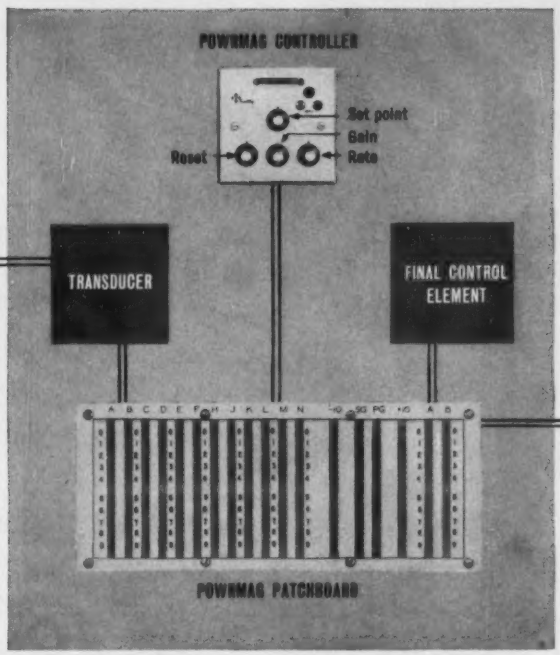
SERIES 2000 KYBERNETES DATA SYSTEM

Completely compatible with the PowrMag Line, the Kybernetes Data Processing System encompasses all the necessary functions to perform logging, calculating and alarm scanning operations. Standard design includes linearization, square root extraction, AC to DC conversion, multiplication, division and digital alarm comparison. Kybernetes 2000 will handle inputs from thermocouples, AC and DC transducers and digital inputs. Input switching is handled by a relay matrix, so arranged that the failure of any input relay cannot invalidate the entire device.

Complete random access to *any* variable is immediately available. The system is completely isolated from induced voltages and from ground currents. A patented, all-electronic self-balancing DC amplifier provides elimination of noise, yet has excellent frequency response. Designed for maximum utilization, the Kybernetes system provides great flexibility. By utilizing parallel inputs, amplifiers and storage devices, it is possible to perform the functions of totalization and computation *without interrupting the normal logging, alarm scanning and visual display functions.*

Pinboard programming on a pre-wired board permits easy selection of the desired operational characteristics, such as: full-scale ranging, trend logging, alarm set points, or function programming of such items as linearization, square root extraction, computations or number of digits to be logged.

CONTROL AND DATA PROCESSING

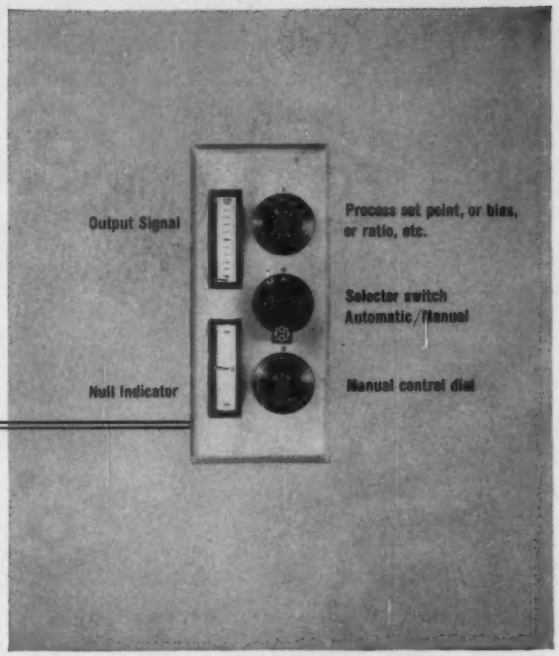


HAGAN POWRMAG CONTROL SYSTEM

A solid-state, Analog Computer Control consisting of four basic elements, PowrMag (magnetic amplifier) combines reliability with extremely low maintenance. A typical system would include:

1. Input Transducers for converting variables into 1-9v DC electrical signals.
2. Analog Control Computer consisting of operational magnetic amplifiers, which, in association with plug-in passive network components, perform all computing functions, including addition, subtraction, division, integration and differentiation.
3. Remote Control Stations to provide for remotely established set points as well as required manual control operations.
4. Final Control Elements, such as electro-pneumatic or electro-hydraulic operators.

Hagan PowrMag control systems are extremely flexible, easy to install, and foolproof. All components plug in and are completely interchangeable. Interconnections are made at a central patchboard by means of taper pins. Requiring a special tool for insertion or removal, the taper pins are foolproof and tamper-proof. Each connection is identified on the patchboard by an alphanumerical combination. Changes in the system are readily accomplished, and more components or loops can be added easily.



REMOTE CONTROL STATION

Easy to operate, cleanly designed, the station requires no operator memory. Front mounting and removal make it ideal for use in compact console installations. Whole station is 2¼" x 5¼"; half station is 2¼" x 3⅛".

Each station uses 12-wire color-coded electric cable with M-S type connector. Full station may contain two single or ganged potentiometers, one switch and two meters. Half stations provide set point, bias or ratio dial plus output signal indicator.

Today PowrMag and Kybernetes equipment is being built or is at work for a wide variety of industries. PowrMag installations include complete boiler, metallurgical furnace, glass furnace and glass fiber die control systems. Kybernetes installations are performing such functions as data logging, processing and calculating as well as temperature monitoring in refineries, power plants, municipal water works and chemical plants. A letter or phone call will put Hagan experience to work on your problem.

Write for PowrMag Bulletin MSP-163 or Kybernetes Bulletin MSP-161.

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Properties of SF_6 gas as an arc-quenching medium provide the first major advance in power circuit breaker design in 20 years.

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Westinghouse power circuit breakers using SF_6 gas are basically new breakers. But they have proved themselves at several voltages and also promise the most practical design avenue in capacities of 460 kv and beyond.

Westinghouse suggests you buy two of these new breakers in widely separated ratings and apply them in entirely different operating situations. Prove to yourself that they will give you combined performance and economy you cannot get in any other breaker.

Call your Westinghouse representative today. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

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The principle of circuit breaker design using SF_6 gas has already been proved successful on several operating systems. Breakers from 46 kv to 115 kv have now completed over two years of service.

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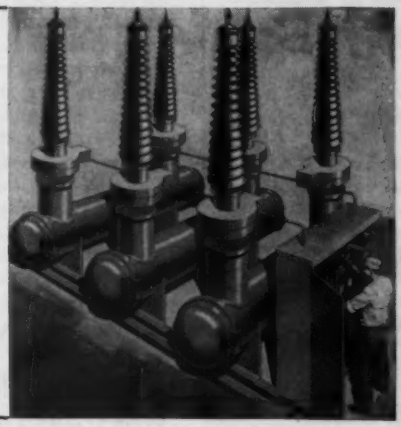

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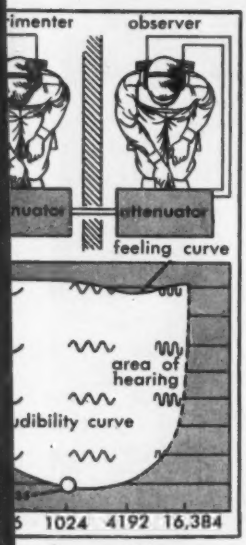

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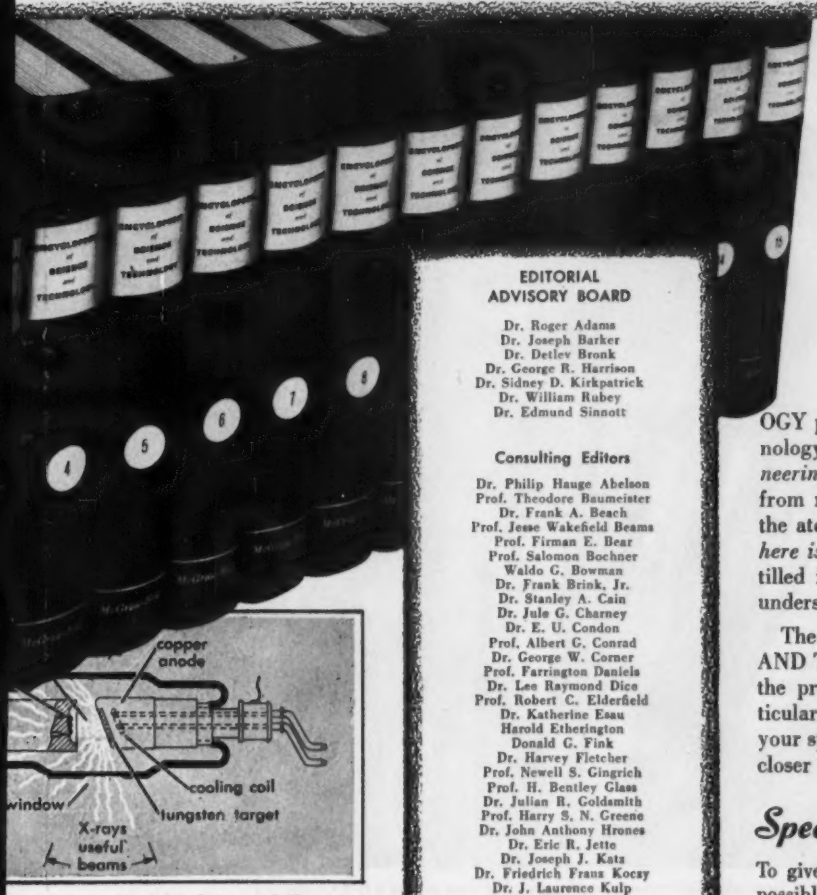

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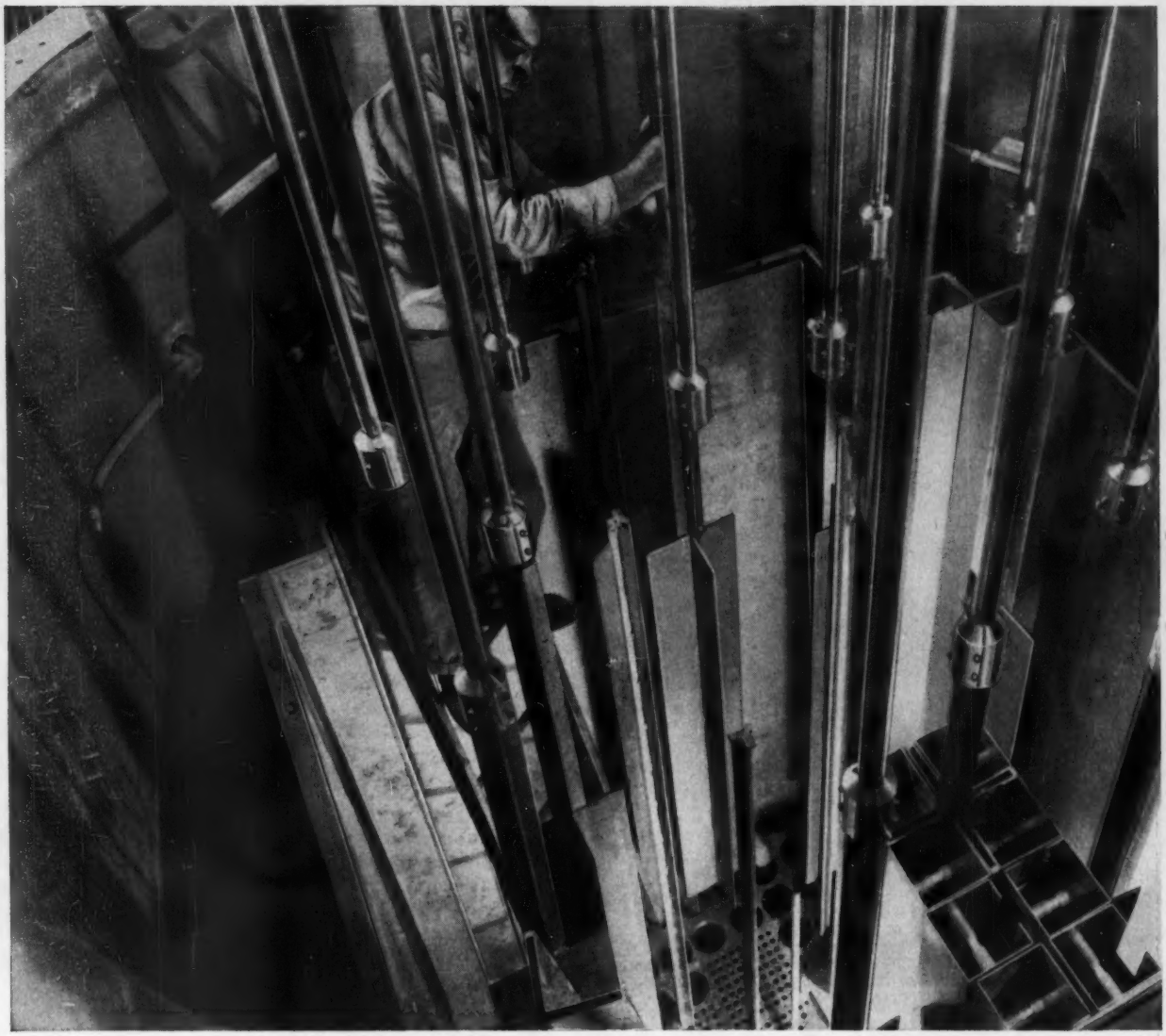

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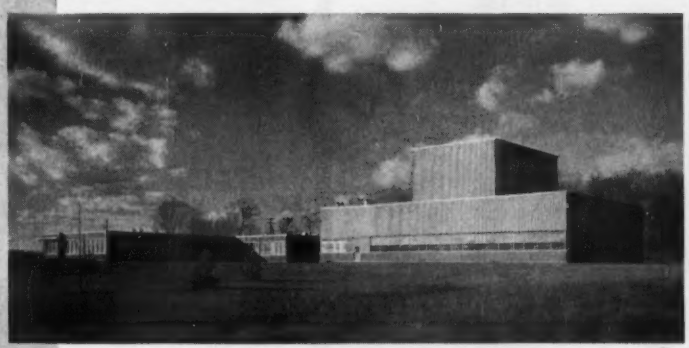

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Trailblazer for Pathfinder

Full-scale critical facility speeds nuclear superheat calculations at Allis-Chalmers Greendale Laboratories

When this reactor at Allis-Chalmers nuclear test facility "went critical" *on schedule* late in 1959, a big step was taken toward successful completion of the world's first power reactor with integral nuclear superheat. The initial use of this valuable research tool will be for studies of the reactor core for Pathfinder. This controlled recirculation boiling water reactor is owned and will be operated by Northern States Power Co., Minneapolis, Minnesota.

This is just one of the major test facilities at Greendale Laboratories. Others include a steam separator test loop, complete facility for developing underwater handling techniques, a battery of corrosion loops, heat-transfer loops, water purification filter tests, and other experimental facilities.

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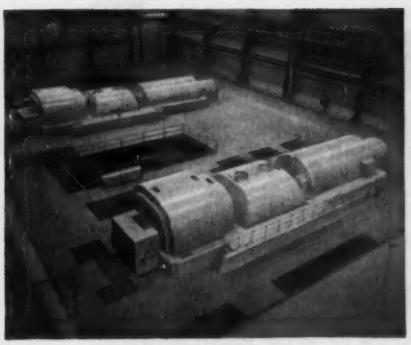

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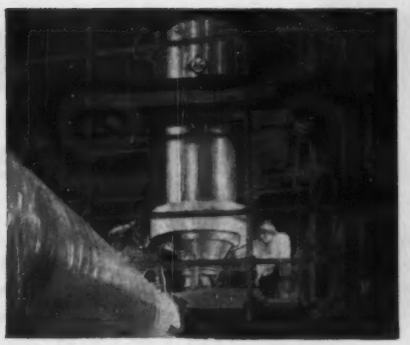

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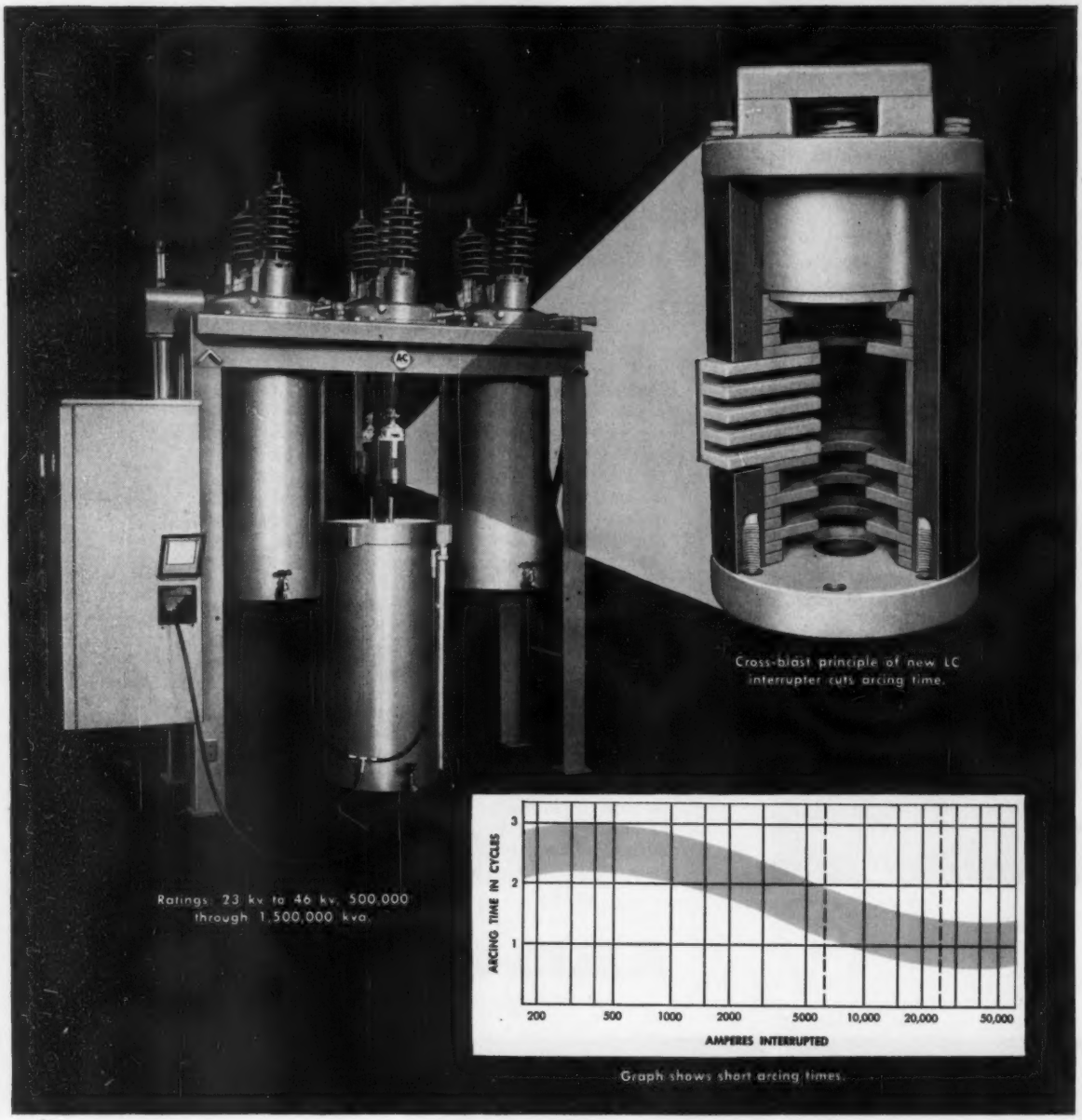


industry's newest interrupter

Here's new high-speed interrupting efficiency for Allis-Chalmers frame-mounted circuit breakers. New LC interrupter cuts arcing time. There's greater system protection, less oil contamination. Dielectric strength is extended, maintenance lowered.

More A-C breaker bonus benefits! You get mechanically trip-free operation. Highly successful *Pneu-Draulic* operator provides fast operation—ends moisture, rust, freezing. Hydraulic power-operated tank lifter cuts raising and lowering time by 80%.

For all the facts on these frame-mounted breakers, call your nearby A-C office or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

Pneu-Draulic is an Allis-Chalmers trademark. A-1248

Time to Settle U.S. Position on EHV Steps

At long last the electrical industry in this country is turning to the neglected question of what the next steps in transmission voltage above 345 kv should be. Vigorous discussion was stirred up by a recent proposal before the AIEE that 500 and not 460 kv should be the next step, and that consideration be given to 690 and 750 kv as later steps.

Before the choice is made, several questions need to be resolved. Should the U.S. follow the European practice of adhering to even multiples of a hundred kilovolts? Should systems here continue to pick voltages that are even multiples of 115 kv? Or should they accept increments that are related by attractive ratios of capability to popular system voltages now in use? Shouldn't the difference between nominal and maximum transmission voltage be the same everywhere instead of 5% in the U.S. and 10% elsewhere, at least in the EHV range?

Our early use here of 287 kv for the Boulder Dam transmission lines is at least partly responsible for Europe's preference today for 275/300 kv as a standard. But it no longer offers an attractive capacity increment for our many 115- to 161-kv systems. For them, 345 kv holds opportunities to increase capacity six or seven fold. As a result, it has attained effective standardization through usage in the U.S.

But with so much 230 kv in use and in prospect, what is the logical best voltage for superposition? Even with twin conductors Europe's 380/420 kv offers less than a four-to-one capacity increase. Use of 460 kv is more attractive. It follows the historical 115-kv multiple but has the disadvantage of fostering a declining percentage of change between voltage steps, thereby increasing the number of steps. Resort to 500 kv has been proposed as providing a more appropriate increment above 345 and permitting European and U.S. standards to converge.

The difference between nominal and maximum transmission voltage in the U.S. and abroad stands today as an impediment to international standardization of transmission voltages above 345 kv. In this range there's room to question the need to continue the 5% rule in the U.S., particularly when a sizable segment of Canadian practice seems to prefer the European 10% rule. Today, depending on whether 460 or 500 kv is adopted as the next step above 345 kv, and whether the difference between nominal and maximum voltage is 5 or 10%, standardizing bodies face a choice among 483, 500, 525 and 550 kv. Certainly apparatus manufacturers cannot be expected to relish furnishing equipment for such a range.

From all this, one need emerges: The electrical industry must address itself to the problem of standardizing EHV voltages so that development and design of power systems can proceed on a sound basis in cooperation with the rest of the world.

Such public airing as this problem received at AIEE cannot help but strengthen the position of U.S. delegates to the International Electrotechnical Commission. It is therefore important that the pros and cons of the divergent views continue to emerge from responsible U.S. technical committees through free and open debate.

Largest Underground Plant Nears

Alcan's subterranean Chute-des-Passes plant in northern Quebec, billed as the world's biggest, has a rating of one million hp. Its five 200,000-hp hydraulic turbines are now in operation. Project took three years, cost $150 million.

The world's largest underground powerhouse is rapidly nearing completion in northern Quebec. Already, its five 200,000-hp hydraulic turbines are in commercial operation.

The one million-hp plant is being built at Chute-des-Passes on the Peribonka River, a part of the Saguenay system which supplies much of the power requirements of the aluminum industry in the area. It is being built by Aluminium Co of Canada, Ltd, to help supply its needs as well as those of the Saguenay Valley below. Its five Francis turbines, built by English Electric Co, will add a million hp to the present 2.6 million of the system. It will be delivered at 345 kv, Canada's highest.

Each of the 200,000-hp units is more than 10% more powerful than any previously installed water turbine in Canada. During recent high-head tests, one of the units developed 246,000 hp with the gate partially open. This, reportedly, exceeds by about 20% the highest power ever generated by a hydraulic turbine. Previous reports of 200,000 hp delivered from water turbines have come from Canada and Sweden.

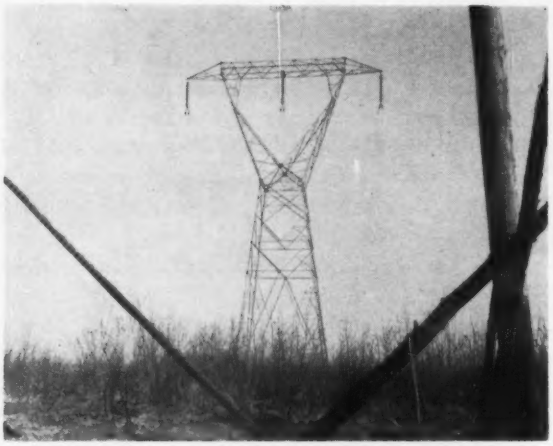
The economics of larger water turbine units are similar to those for larger thermal stations. With proper design to reduce losses, efficiency goes up with rating.

Aluminum Used Heavily

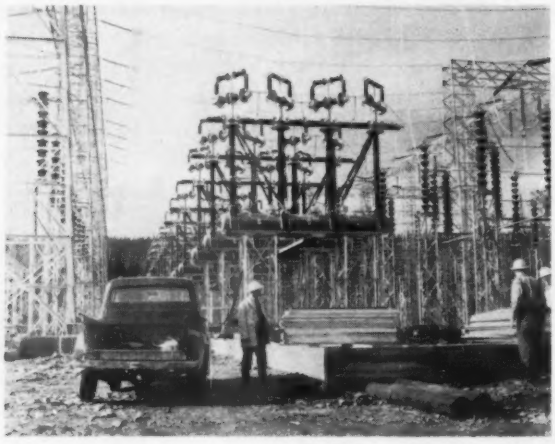
One of the unusual features of Chute-des-Passes is its heavy use of aluminum, perhaps to be expected in view of its being built and owned by an aluminum producer. Among its features:

- Aluminum-wound coils in its largest transformers. They are single-phase, rated at 33/44/55/66 mva each, with fans and coolers.
- Four experimental single-footed, guyed aluminum towers (EW, Mar. 7, 1960, p70).
- 1,100 miles of 850 MCM ASCR conductor for transmission lines.
- 12-inch aluminum channel conductors from the underground generators to the outdoor transformers.

The new Chute-des-Passes Station is six miles below Alcan's Passes Dangereuses storage and control dam, built during World War II to help boost aluminum production.



345-KV LINE towers were designed in Italy. Here stringing is being carried out near Isle Maligne



BREAKERS are air-blast. They are rated at 385 kv, 1,000-amp, with symmetrical breaking capacity of 8,000 Mva

Beset With Problems

The contractor, Perini-McNamara-Quemont, Ltd, has been hampered by poor roads and —60F temperatures. The three-year project, now nearing completion, will cost $150 million.

Planning problems had also faced Alcan and the consulting engineers of the H. G. Acres Co. Unusual topography made difficult the design of a surge shaft for the long supply tunnel to the generators. Hence the designers vetoed conventional construction in favor of an underground powerhouse and supply tunnel.

The resulting plan called for an intake 600 ft behind the Passes Dangereuses Dam with a 50-ft unlined intake tunnel 640 ft long leading to the horseshoe-shaped supply tunnel, 35 ft across and concrete-lined. This design permitted the construction of the 3⅓ million cu-

Completion

ft unlined surge tank 2,800 ft upstream from the penstocks. It connects with the supply tunnel through a 30-ft concrete-lined surge shaft. A special surge feature is a retention tank which allows retaining of water during full-load rejection through the turbine.

The height of the powerhouse for these five 200,000-hp turbines was kept to 109 ft to minimize excavation. It is 477 ft long and 70 ft wide, concrete-lined throughout. It connects to the surface 450 ft above through an elevator to the surface switching station control house, five shafts for the conductors from the five 14.4 kv generators, and a construction adit, left open for entry and removal of heavy equipment. Two 100,000-cfm centrifugal fans will ventilate the powerhouse. Water from the turbines will flow six miles back downstream to the Peribonka River through a 48-foot tunnel. (See cross-section diagram below.)

The contractor initially drilled three adits to give access for the subterranean construction. The first is 7,500 ft below the intake, the last at the powerhouse, and the other half way between these. The upper two will be sealed at the completion of the project.

POWERHOUSE for housing turbines was kept small to hold down excavation costs. It is 477 ft long, 109 ft high, 70 ft wide, is concrete lined throughout

Tunnel Had 30,000-Ton Plug

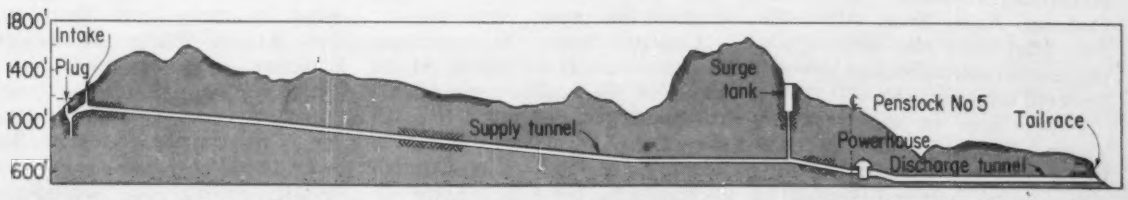
Highlight of the construction was an underwater blast of thirty tons of high explosive to remove 30,000 tons of rock, the last separating the river from the intake tunnel. To prevent shattered rock from damaging the intake tunnel or the dam, only 600 feet downstream, the builders relied on a carefully planned blast and an enormous pit in the tunnel floor under the blast site to catch the broken rock. Divers who went down after the breakthrough reported it was successful.

The completed Chute-des-Passes plant will further feature electro-hydraulic turbine governors, familiar on steel mill drives but comparatively recently used for hydroturbine control. They were built by English Electric. The five generators can operate separately or locked as one machine. With only one unit in operation, any of the giant turbines is reportedly capable of 265,000 horsepower.

The high-voltage airblast breakers are rated at 380 kv and interrupt in three cycles.

Current from this switching station will flow 91 miles to Saguenay over two circuits. One runs over toughened glass insulators while the other is on porcelain. The transmission towers, except the four experimental aluminum ones, are of steel. Initial power will flow at half the design voltage. Initial connection of the transformers in delta instead of the eventual wye provides this reduced potential.

With full operation in 1960, these new 750,000 kw will provide for future as well as immediate Alcan smelting loads, and leave a surplus to help attract more industry to the Saguenay Valley.



UNDERGROUND CROSS SECTION shows 31,000-ft tunnel, concrete-lined, through which water flows to turbines. Note tunneling necessary for intake, plug, surge tank, discharge tunnel and tailrace. This gives an idea of job's size

ICE STORM in Tennessee had lines down at Lookout Mountain near Chattanooga. Many homes in the area were without power in hardest hit part of the state

IN TEXAS ice took its toll also. Although some interruptions lasted sev-

Weather Batters Utilities Around

But electrical damage is not so high as expected. Paradoxically, heaviest snows accompanied slightest damage

A severe storm that swept over much of the nation between March 1 and March 6 left a wake of power outages in many areas, with ice and wind listed as the primary destroyers. Conversely, some locales with snow drifts well over 10 ft high had very little or no electrical trouble.

Alabama, particularly the northeastern section, had its worst ice storm in 20 years. Electrical system damage estimates ranged into the millions of dollars. Rains fell on March 1 and 2 and snow fell the night of March 2 and March 3. The moisture in combination with below freezing temperatures snapped power poles and lines in a seven county area including the cities of Huntsville, Gadsden, Guntersville, Cullman, Arab, Boaz, Albertville. The cities were also without telephone communication, and icy roads hindered transportation.

Power lines of the Tennessee Valley Authority and Alabama Power Co were affected and their repair crews restored service as quickly as possible. Alabama Power loaned 13 emergency crews to Georgia Power Co, one to Fort Payne, Ala., and still another to the Arab Electric Cooperative.

TVA lost three 161-kv lines. Two of these were out of service from 20 to 30 hours and a third was still out at noon Monday, March 7. Interruptions to TVA wholesale customers lasted from a few hours to three days, with most back on the line in three hours.

Hardest hit small area in the southeast was the 500 sq mi area served by the Electric Power Board, Chattanooga. General Superintendent S. R. Finley reports damage will run between a quarter and half million dollars. Restoring service to nearly 9,000 customers required the help of borrowed crews from Nashville, Knoxville and several contract line crews.

Georgia Power is estimating damage at about $750,000. At the height of the trouble some 60,000 customers were without service. All service in Atlanta was restored by Monday, March 7. In northern Georgia (the company's Rome division) about 80% of the customers were cut off, but line crews' efforts restored service to all but 15% on Monday. Besides the Alabama Power crews that assisted Georgia Power, others were supplied by Florida Power Corp, Gulf Power Co, TVA, and Savannah Electric & Power Co.

Wide areas of east Texas and northwest Louisiana were without power several days as the result of a crushing ice storm. Texas towns worst hit were Marshall, Longview, and Gilmer. By the end of the week most had service again, at least on a temporary basis. Worst damage in Louisiana was near Vivian.

Bill Brandon of Southwestern Electric Power Co estimated cost at $175,000, and said, "It was strictly distribution trouble from tree limbs breaking lines."

Breaks began March 2. Service was restored to most of the system by March 5.

At Marshall, Southwestern crews, aided by crews from Beaumont, Port Arthur, Orange, Shreveport, Longview, and Waldron, Ark., started getting downed primary lines back in service after ice damage. Then, in the words of Ben Sedberry, division manager," . . . it started thawing—the secondaries started breaking. I've never seen anything like it."

eral days, most had been restored by week's end, if only on temporary basis

the Nation

Panola-Harrison Electric Cooperative at Marshall had outages over 100% of its system, but not all at the same time, according to George W. Ross Jr, general manager. The system has 1,100 miles of line serving 5,300 customers in east Texas and Louisiana.

Upshur Rural Electric Cooperative Corp at Gilmer had a similar report. It serves 10,000 customers with 2,500 miles of line. Hill County and Wood County Cooperatives supplied extra crews.

Freezing rains at Knoxville, Tenn., caused outages in virtually every part of the city and county. In most cases, however, the areas affected were small and scattered.

Farther north, Atlantic City, N.J., had outages attributed to heavy snows and high wind. Wind caused damage that took about 2,245 homes off the line twice on March 3. This was in the Inlet section of Atlantic City. Another neighborhood affected was Wildwood with 1,600 homes out.

Thousands of homes were without service in the Cape Cod and South Shore areas of Massachusetts. Emergency crews of the Cape and Vineyard Electric Co worked around the clock during the record storm, restoring most service by Sunday.

Court Rules Against Indians

The major legal roadblock to construction of the Niagara River Hydro-Electric Power Project was swept aside on Monday by the U.S. Supreme Court.

In a 6-3 ruling written by Justice Charles E. Whittaker, the Court says the Tuscarora Indian Nation must give up some 1,300 acres of tribal land needed for a storage reservoir to serve the planned power project. The Supreme Court reversed a lower court ruling in favor of the Tuscaroras, who objected that Congress had not specifically consented in 1957 to condemnation of their tribal lands when it authorized construction of the $700-million Niagara Project.

Whittaker's ruling says the Tuscarora lands are not legally "Reservations" as that word is used in the Federal Power Act. For that reason, he said, it is not necessary for Federal Power Commission to exclude use of the Tuscarora lands for the reservoir to be built by the New York State Power Authority.

Whittaker also ruled that the Authority may condemn—on payment of just compensation—the Indian lands under the general powers included in the Federal Power Act, without specific Congressional authorization. The Indians, balking at having to move at all, refused a 1958 Power Authority package offer of about $2.4 million including $1.5 million for the land.

The high court ruling opens the door for final negotiations between the State Power Authority and the FPC over the size and location of the Niagara storage reservoir.

Probably, New York will ask the FPC to withdraw its temporary license plan to build a smaller (45,000 acre-ft) reservoir staying off the Tuscarora reservation. In its place, the state will file a new plan, calling for a 62,000 acre-ft reservoir to cover some of the Indian lands. The new reservoir will be larger than the 60,000 acre-ft reservoir first planned (but challenged by the Indians), although it will occupy less than the original 1,383 acres to be flooded.

Glen Canyon Ground Rules Discussed

Preliminary sessions between investor-owned utilities and the U. S. Bureau of Reclamation on the subject of disposition of Glen Canyon power brought out the USBR ground rules that would govern a proposed transmission grid.

Utah Power & Light, Arizona Public Service, Public Service Co of Colorado, Public Service Co of New Mexico and Pacific Power & Light are proposing to build a huge transmission network to take power from Glen Canyon. They would expand steam generation to supplement power from the federal project, and would wheel power to preference customers of the government.

N. B. Bennett Jr, assistant commissioner of the USBR, Washington, D. C., told utility representatives at a Salt Lake City meeting some requirements USBR will make.

- Lines must be of sufficient capacity for delivery of available power.
- There must be no interference with the ability of the USBR to serve preference customers to the extent they would be served by federally constructed lines.
- Backbone lines must provide suitable integration among federal power projects at the time required to meet project requirements, and project use must at all times be the overriding consideration.
- Charges for delivery of power must not adversely affect the project feasibility and payoff, and particularly must be such as not to reduce quality or timing of irrigation assistance.
- If utilities construct the backbone, high voltage transmission lines, they must accept also the responsibility of providing transmission for delivery as lower voltage to load centers of preference customers to the same extent as would prevail under a federally constructed system.

Priest Rapids Payola Suspected

First trial resulting from a two-year grand jury investigation of the Grant County (Wash.) PUD is scheduled to begin March 14 in Grant County Superior Court.

The trial involves Frank T. Bell, Ephrata businessman, who is charged with perjury. Bell has waived his right to a jury, thus leaving a decision in the case up to the judge.

Charges are from testimony concerning relations between Bell and the McLean Engineering Corp. Prosecuting Attorney Paul A. Klasen Jr asserts that the McLean company received money from Merritt-Chapman & Scott, holder of a $92-million contract to build Priest Rapid Dam for the PUD, and that it "made payments to public officials."

The Bell indictment is the only one to be returned by the grand jury so far, although the jury still meets occasionally. The jury's investigation has centered around the activities of Glenn T. Smothers, who resigned as manager shortly before the jury convened. Nat Washington, former attorney for the PUD, was instrumental in calling of the grand jury, alleging that Smothers had violated state law in extra work orders and equipment purchases on the dam project.

Klasen, the prosecuting attorney, is attempting to have Robert E. Harvey of New York, president of Merritt-Chapman & Scott, appear before the grand jury but so far has been unsuccessful. Merritt-Chapman attorneys have appealed an order granted Feb. 26 by New York County Judge which would force Harvey to appear before the grand jury March 21.

Edison Medal Candidates Picked

Five progressive electrical utilities have been selected to compete for the Edison Electric Institute Edison Medal. From nominations made by the EEI Edison Medal committee and from members at large, a review committee selected the companies listed below. The review committee was composed of P. B. Garrett, publisher and editor, *Electric Light & Power;* C. W. Leihy, publisher, *Electrical West,* and C. F. Hochgesang, editor, *Electrical World.* Here are the five citations.

Commonwealth Edison Co—For its enlightened, significant contribution toward development of economic nuclear power by its intensive efforts culminating in achievement of critical operation of Dresden Nuclear Power Station, the country's initial full-scale reactor plant completely financed by private enterprise; for accomplishing the objective within time and cost estimates; for outstanding efforts in construction of low-cost residential underground distribution; and for furthering utility experience in residential electric space heating.

Detroit Edison Co—For outstanding business statesmanship in promoting civic responsibility among its employees through the sponsorship and development of its "applied citizenship committee" for providing the necessary training facilities for developing an informed electorate; and for encouraging employee participation in political and community activities; all leading to the preservation of the traditional American free enterprise system.

Duke Power Co—For completion of engineering planning of the Catawba River Development, involving thirteen hydroelectric plants and five steam plants; and for carrying forward an outstanding employee training and management development program, together with a notably effective effort to achieve improved customer and public relations.

United Illuminating Co—For outstanding leadership in promoting large-scale urban redevelopment in New Haven, Conn.; and for fostering active participation of its executives on civic committees and in urban development programs in its service territory.

Western Massachusetts Electric Co—For research and promotion in developing successful application of electric space heating to commercial buildings in cold climates; for furthering experimental heat storage systems to implement such installations, including one in the company Systems Headquarters building; for instituting promotional rates for such service; and for continuing aggressive development in the residential space heating field.

Atom Youth Conference Acceptance Is Growing

Speakers have been complimentary and utilities enthusiastic as plans for the Second National Youth Conference on the Atom make progress. PIP reports that 56 utilities in 26 states have written to say they will send delegations. Indicated total attendance at the last report (Mar. 4) stood at about 600. It will be at the Museum of Science & Industry, Chicago.

PIP needs to have written notification of a company's participation. Some acceptances at this point are only verbal, though they are not included in the above figures.

Victor M. Showalter, a science teacher from Fairmont High School, Kettering, Ohio, will be presiding moderator at the first general session Oct. 20. In his acceptance, he said "The conference incorporates many features that can give direction to and stimulate enthusiasm."

New Tests on Insulating Oil Discussed

Annual Doble Conference discusses insulating materials and various methods of testing that are coming out of research. Talks covered transformers, tools, hardware

New techniques for evaluating insulating oils provide a reliable indication of the oil's suitability in as little as 15 to 20 hr, 300 engineers at the 27th Annual Doble Conference were told. In addition, these techniques provide a fingerprint of any given oil which enables the user to differentiate shipments of oil from the same supplier, F. C. Doble told the conferees. Known as the power factor valued oxidation test, the method gives a continuous plot of variations in p.f. while the oil is under an accelerated oxidation life test. All good oils have an average p.f. of less than 2.5%, hit their peak p.f. in 8 to 18 hr, and have a peak of less than 5%, F. S. Oliver of Doble Engineering Co reported.

Report Substantiated

Floor comments from representatives of two major oil companies substantiated these claims. Gulf Research has been using the technique for six months, as a quality check on production. It permits much faster calculation of data, the conference was told. A similar note of approval came from H. L. Baker of Esso Standard Oil Co.

Another new development reported was the Doble Gassing Tendency Test, a Pirelli-type technique which provides a routine test using hydrogen to determine whether an oil gasses under electrical stress. By using nitrogen or an inert gas, the test can be used to make a critical study of inherent oil characteristics responsible for differences in rate of gas evaluation.

Reporting comparative tests of plastic-coated and regular varnished hot line sticks, S. H. Osborne Jr and G. W. Armstrong Jr of Doble contended that wood members with 0.2-in. plastic coating which showed losses greater than 0.3 w for two 3-inch sections in parallel could be assumed wet under the plastic. Any member with a higher loss should be questioned. If the plastic coating is thicker, test limits may be even more critical, they said.

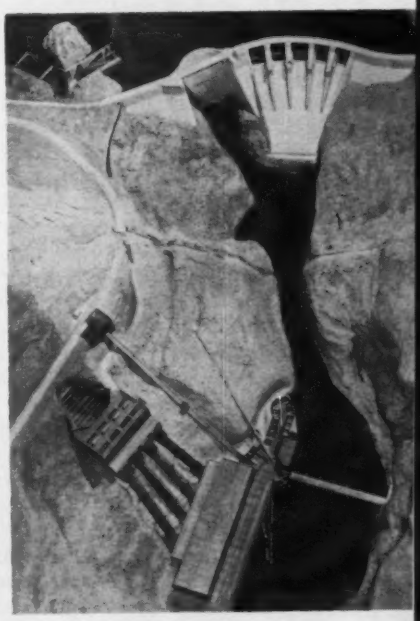
An additional lightning arrester test to measure contamination level and help develop a contamination warning test was suggested by W. H. Eason, General Electric Corp. Eason suggested testing at a small fraction of rated voltage after the porcelain had been wetted with an atomizer. Commenting on the large body of data on reduced voltage tests accumulated by the Doble lightning arrester committee, he acknowledged that both full voltage and reduced voltage tests have considerable value and may detect different troubles.

In the rotating machinery session, E. H. Povey of Doble told the conference that power factor tip-up measurement gives an indication of the average level of ionization in a machine winding. By contrast, radio influence voltage measurements may be used to detect small areas of severe ionization.

Commenting on the failure of a 3,000-hp motor under accelerated life conditions, R. G. A. Brearley, Aluminum Co of Canada, warned the conferees that, with higher volt-per-mil insulation, corona may occur in 6.6-kv motors and possibly even in 4-kv machines. In another session, Brearley noted that at room temperature, the power factor of a deteriorated line-coupling capacitor is so close to that of a sound one that the p.f. test can not be relied on for maintenance tests. However, field tests last winter indicate that under freezing conditions, differentiation may be easier and some warning is available.

P. L. Bellaschi, consultant, stated that more complex reduced insulation transformer designs made accurate corona measurement necessary. He suggested that corona measurement during low frequency tests was desirable. Bellaschi contended that lightning arresters more able to handle switching surges and using shatterproof internal porcelain were needed. Present thinking should consider a voltage wave rising to crest in a few hundred microseconds and receding to half crest in 1,000 to 2,000 msec, he continued.

In a report on the development and comparative composition of different Askerals, P. G. Benignus, Monsanto Chemical Co, told the conference that there was no evidence that mixing two different Askerals was harmful. No chemical reaction between the various scavengers used has been detected at Monsanto, he declared. Benignus also outlined precautions for handling Askerals and included specifications for all major types of Askerals.



Final Work on Mayfield Started by Perini Corp

Final stage construction on Tacoma City Light's Mayfield Dam, shown here as a model, has been started by Perini Corp. The spillway to the right, built on solid rock, dwarfs the 185-ft-high arch which blocks a canyon only 40 ft wide. Four turbines will take the entire river flow and will generate 160,000 kw. Up and down lifts will give fish their "river rights."

The Case for Aggressive Selling

School air conditioning, industrial and commercial lighting jobs reflect the payoff, Missouri Valley group learns

Increasing the power usage of commercial and industrial customers may call for soft-sell techniques at times. Judging from talks at the Missouri Valley Electric Association's Commercial and Industrial Sales Conference, however, one could conclude that aggressiveness is the utility power salesman's forte.

The majority of speakers at the Feb. 8-9 session dealt with sales results and programs hinging on forceful, dynamic approaches.

Neil J. Thompson of Kansas Power & Light Co, for example, said aggressive selling has resulted in an 800% increase in commercial lighting sales. He told of one service station job where he recommended twice as much lighting as the oil company's headquarters had stipulated. After the job was sold and installed, the enthusiastic owner put two and a half times as much lighting in his next station.

Year-round air conditioning is a feature of a new high school near Wichita, Kan., that opens next fall, said architect V. L. Loebsack. A 700-hp heat pump will heat and cool several buildings occupied by between 1,200 and 1,500 students. The school's progressive board insisted during its search for an architect that he be willing to consider electric heating. C. A. Brannen of Kansas Gas & Electric Co supplied the board its information, including proof of the successful performance of heat pumps in large buildings.

By emphasizing the all-electric advantages and making a competitive evaluation of equipment, D. W. Runquist sold the air conditioning job for a new St. Joseph, Mo., hospital. The St. Joseph Light & Power Co representative said it resulted in an additional 400,000 kwhr/yr and annual revenue of $7,000. His tips for such projects: Get on the job first; put the competitor on the defensive; deal with and sell the customer first; know your competition; have local information available; and take advantage of satisfied users.

Top management is getting in on sales activity at Oklahoma Gas & Electric Co. Executives sat in on a recent series of eight meetings with industrial customers interested in a lighting presentation.

Relighting Jobs Increase

Held in eight different OG&E communities, the meetings attracted 242 visitors, said W. H. Mapes, the utility's supervisor of industrial sales. The one-hour presentation covered economics, what constitutes good lighting, a demonstration of General Electric Co's "See-Level-Comparator" (EW, June 22, 1959, p 125) and a sound slide film summary. The meetings just concluded, Mapes said, and already 32 relighting installations had resulted.

Sell your customers on the heat pump, said Glenn Boverie of Union Electric Co. Once they're sold, the architects and consulting engineers will get the word on what the customers want.

Emphasize Food, Labor Economics

Oscar Amador of Iowa Electric Light & Power Co said the big challenge in selling commercial cooking is to change the food service man's habit of cooking with a flame.

This can best be done, he said, by creating the picture of less work and more profits. Emphasize food and labor costs because these are the ones that count. In the final analysis, a saving of 5% in food costs and 5% in labor costs. which can be realized, will be a big factor in profits of a food service establishment, said Amador. Then, when you have a commercial customer on the lines, treat him with care; he will help sell others, the Iowa EL&P representative said.

'It's Later Than You Think,' Warns Czeschin on Taxes

To combat the tax advantages that public power now has, private power companies should encourage each employee to take a more active part and a far greater interest in politics. This advice of Charles Czeschin, president of the MVEA and of Arkansas-Missouri Power Co, was accompanied by the warning, "It is later than you think."

He said that if private power companies are not given some tax relief or the public power groups are required to pay something approaching the same taxes, he questions how long the companies can continue to exist.

Besides the tax advantage, he said, the public agencies are able to secure all the money they desire—"not what they need"—from the federal government at 2% interest or have it given to them outright with no strings attached. Meanwhile, Czeschin continued, the power companies have to go into the money market and pay an interest rate that approaches 6%. The advantages of the public power group in the money market is equal to, if not greater than, its advantages in escaping taxes, he declared.

CZESCHIN: Unequal advantage

Small Computer Handles Power Billing

Billing of power interchanged with four systems is calculated with greater speed, accuracy and consistency. Completion of first year's use proves the value of the computer

W. B. TAGEN, Supervisor, Production Dept,
F. J. SHERMAN, Supervising Engineer, Engineering and Construction Dept, Boston Edison Co, Boston, Mass.

Small in physical size but large in the value of benefits to Boston Edison Co is a general-purpose digital computer now being used in the calculation of interchange power billing. The first use of a general-purpose machine for power billing followed installation by the company's System Operating Dept of a Royal McBee LGP-30 computer in July of 1958.

Experience to date with the computer has shown that:

1. The monthly bills for interchange power can be produced on the first business day of the succeeding month, with as much as a nine-day reduction from prior calculating machine time lag.

2. Consistency and accuracy in calculating interchange costs are improved.

3. Clerical labor previously handling interchange billing is released for work in other areas.

4. The technique of allocating costs for billing is no longer heavily dependent upon accumulated experience of the billing clerks.

5. Speed of computation allows more time for other functions of the System Operating Dept.

The decision to adopt a digital computer for interchange billing was based on careful study of the many factors involved in the billing operations, and in other areas in which we believed the computer would be of use. An understanding of the reasons for the change, considerations in the choice of the computer, and present and anticipated use of the computer may be gained by looking briefly at Boston Edison's operations.

The company serves an area of about 587 sq miles including the city of Boston. It has three steam electric generating stations: L Street Station in Boston proper, with a normal operating capability of 271 Mw; Edgar Station, ten miles south of Boston, with 449 Mw; and Mystic Station, five miles north of Boston, with 467 Mw. There are interconnections with four adjacent systems: New England Electric System, Cambridge Electric Light Co, New Bedford Gas and Edison Light Co, and the Metropolitan Transit Authority.

Two Types of Power Contracts

Interchange power contracts with these neighboring companies fall into two types: sales of fixed blocks of power at a specified contract price; and economical incremental interchange of power. The latter type of interchange may be at cost plus, or under an arrangement whereby the savings incurred by displacing generation on the receiving system are split equally between the parties. In all contracts transmission losses are considered as a legitimate expense chargeable to the transaction.

Dispatching and interchange billing are handled by the system dispatching group, which formerly included two men working on load forecasting, and six on interchange billing. This group is under the control of the chief system dispatcher of the System Operating Dept. The two men responsible for load forecasting prepare load forecasts 24 hr in advance and determine the dispatch of generation to meet these forecasts.

In negotiating an interchange, the dispatcher may quote costs of delivered power. Following the transaction, the power costs of the two companies are determined more exactly and the price of energy delivered is established. This procedure formerly involved considerable clerical work with system and station load records, from which the applicable sale was allocated to the highest price slope costs of the stations, and line losses determined.

These data were sent to the machine accounting group where the costs were multiplied by the kwhr of sale, and a listing of hourly costs and a daily summary of these costs

obtained. Final calculations for monthly billing often could not be completed for eight to ten days after the first of the month.

In reviewing these operations, it was determined that it would be possible to expedite the procedure and reduce manpower in the interchange billing group if the work could be performed on a small computer at the dispatching center. Basic requirements were that the computer be in the lower price range, that it satisfactorily determine interchange power costs, and that it calculate the complete interconnection billing.

In determining which digital computer to obtain, it was desired that there be a minimum of special installation requirements, because the machine was to be located in the existing dispatching center. It must not require extensive training for operation because it would be operated by non-technical personnel. It was also felt desirable to store the most probable machine combinations with their appropriate slopes and Mw limits internally and call upon them as needed. Therefore, the machine must have as large an internal memory as possible. Of the machines that might fulfill these requirements, the Royal McBee LGP-30 was selected as the best suited.

Boston Edison Co interchanges power regularly with its four neighboring systems. This interchange power may be sold or bought to meet Edison's needs, or may be provided for resale to another system. In addition, Edison's facilities may be involved in the purchase of power by any of the four systems for resale to another system.

The program for interchange billing computes the Mw of each slope and the cost of each slope as at the center of the system, starting with the maximum indicated generation at each station. The Mw and incremental rate of the highest cost slope are assigned to the highest cost sale. Any balance of sale is satisfied by successively decreasing slope costs. As a slope, or partial slope, is allocated to a sale, the Mw available from the slope is reduced so that, in following sales of the same hour, the same power cannot again be allocated. Similarly, as a sale is computed, it is removed from the computation. The cost of delivered power then is computed.

The digital computer calculates the interchange incremental rates on an hourly basis, taking these factors into account:

1. The priority of sales, i.e., the order in which they are calculated and the number of sales to the four interconnected companies, may vary from hour to hour.

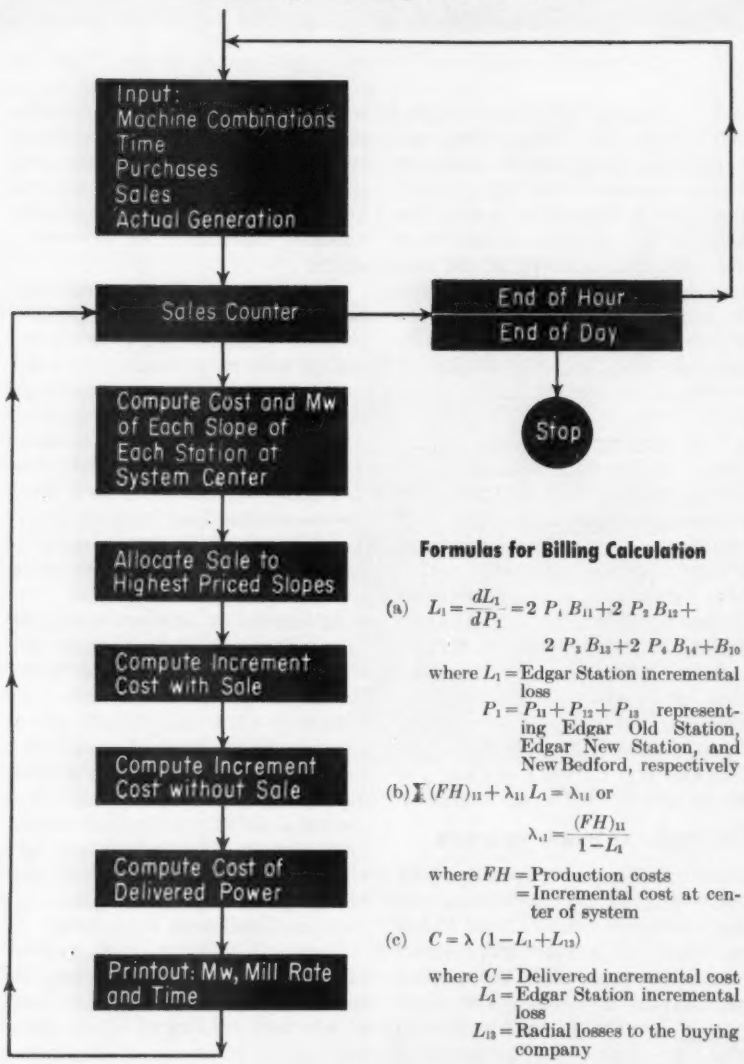
2. Incremental cost of interchange power is determined by including both the incremental cost of production and the incremental cost of transmission losses up to the delivery point. Incremental cost of power at an interchange point is the average of the incremental cost with the sale and the incremental cost without the sale.

3. There may be more than one sale to a company at the same time. There may be a sale and a purchase to a company in the same hour. There may be a fixed contract sale to any company any hour. All incremental sales are at costs above those incurred by Edison in supplying its own load.

4. Power generated at a station operating at minimum load for Edison's own requirements may not be sold. Minimum loads are subject to change under various operating conditions. Any power bought for the relaying of Edison load may not be sold.

5. Production cost of power for each

Interchange Billing Flow Chart



Formulas for Billing Calculation

(a) $L_1 = \frac{dL_1}{dP_1} = 2\,P_1 B_{11} + 2\,P_2 B_{12} + 2\,P_3 B_{13} + 2\,P_4 B_{14} + B_{10}$

where L_1 = Edgar Station incremental loss

$P_1 = P_{11} + P_{12} + P_{13}$ representing Edgar Old Station, Edgar New Station, and New Bedford, respectively

(b) $\sum (FH)_{11} + \lambda_{11} L_1 = \lambda_{11}$ or

$$\lambda_{11} = \frac{(FH)_{11}}{1 - L_1}$$

where FH = Production costs
= Incremental cost at center of system

(c) $C = \lambda\,(1 - L_1 + L_{13})$

where C = Delivered incremental cost
L_1 = Edgar Station incremental loss
L_{13} = Radial losses to the buying company

Billing Input

Edison Machine Comb. Codes						Time	Demand	λ	Purchases NEP Min	NEP λ	NEP Max	MTA Min	MTA λ	MTA Max	CEL Min	CEL λ	CEL Max	NB Min	NB λ	NB Max	L St Area Load
5409	5418	5354	5709	5454	5348	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1720

Sales No.	Co. Code	Mw	Co. Code	Mw	Co. Code	Mw	Edison Actual Generation						Station Min Change		End Code
3	4004	40	4003	160	4000	150	1380	1500	2700	750	770	20	996	20	990

2 #'s for Each Sale

2 #'s for Each Station

Examples of Billing Output

(Multiply Mw by 100)

.0000902'
5409' 5418' 5354' 5709' 5454' 5400' 11' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 1720'
3' 4004' 40' 4003' 160' 4000' 150' 1380' 1500' 2700' 750' 770' 0' 990'

Company	Mw	Mills	Time
Inadv.	.0400	5.016	.0110
NB	.1600	4.624	
NEP	.1500	4.518	

.0000902'
5409' 5418' 5354' 5709' 5454' 5400' 11' 0' 0' 0' 0 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 1720'
6' 4004' 50' 4000' 160' 4003' 80' 4001' 60' 4002' 120' 4000' 30' 1380' 1500' 2700' 750' 770' 0' 990'

Company	Mw	Mills	Time
Inadv.	.0500	5.069	.0110
NEP	.1600	4.906	
NB	.0800	4.241	
MTA	.0600	4.766	
CEL	.1200	4.561	
NEP	.0300	4.399	

programmed station is the product of the fuel cost (F) modified by maintenance and supply costs, and a heat rate or slope (H). Each slope has a minimum and a maximum value, the minimum of one slope being the maximum of the next lower slope.

6. Each station has up to four slopes for each combination of machines. The minimum of the lowest slope is the station minimum; the maximum of the highest slope is the station maximum. An exception to this occurs at L Street Station where a tie-line limitation requires the station minimum to be determined by subtracting the tie-line capacity from the load, and then using the higher of either the minimum so determined or the slope minimum.

7. Scheduled or inadvertent power may flow either to or from any or all of the interconnected utilities.

Incremental transmission losses are calculated from formulas having the form of formula (a). Incremental production costs and incremental line losses are combined as in formula (b). Cost of power at the interchange point is determined by formulas having the form of formula (c).

Supplied to the computer as input are: applicable slopes and actual indicated generation at each station; interchange including fixed purchases and sales; the L Street Station area load; incremental cost of purchased power; and priority of sales.

Stored internally in the computer are: applicable fuel costs; slopes at each station for most probable conditions; and "B" constants. The fuel costs include coal, oil or gas. Output from the computer is incremental for the cost of power for each scheduled sale, and for the cost of inadvertent power sales, for each hour.

A second program averages the incremental rates at the beginning and end of the hour of sale, multiplies the result by the integrated Mwhr of actual sale for each company, and computes the actual incremental dollar cost of sale for that hour. This program also accumulates Mwhr and dollars by period and by day for each company.

A review of the first year's use of the digital computer for interchange billing shows the soundness of the original decision. The immediate effect of the computer was to release

(*Continued on page* 92)

With transistorized, tape-controlled computer like this . . .

In new computation center planned for public inspection . . .

Utility Prepares for Growth in

JOHN HOGG, Manager of Administration, Atlantic City Electric Co

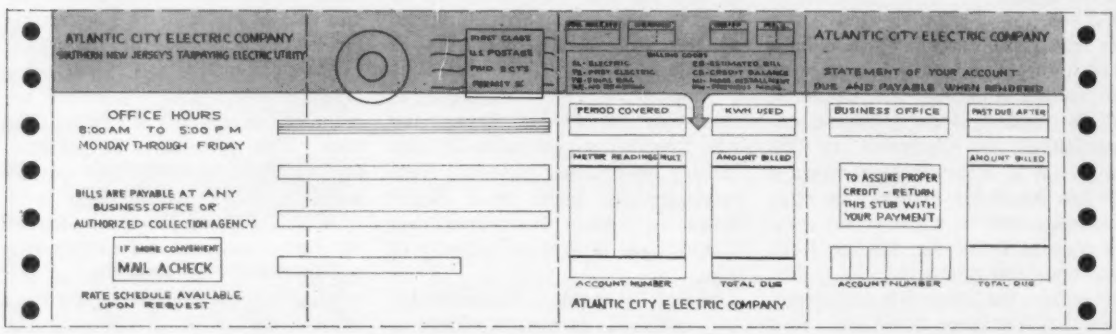
Before the end of April, Atlantic City Electric Co expects to start mailing its service bills from a new computation center near Atlantic City, N. J. Built to house the company's accounting and data-processing groups previously scattered throughout several buildings in Atlantic City, the new facility is planned to serve the company's accounting needs for the next 10 to 15 years with substantial gains in efficiency.

The new computation center, set back on a 30-acre tract fronting on two main highways 10 miles from Atlantic City, was planned as a "showplace." The building's design has already won its architect an award for the outstanding office building of 1959 in New Jersey. It provides about 10,000 sq ft for general accounting, similar space for an RCA 501 digital computer and peripheral equipment, and additional space for employee feeding and recreation, storage, and mechanical equipment. Lighting will be 100 ft c in working areas and 24-hour electric air conditioning is provided.

The computer room, approximately 2,400 sq ft, will be viewed by visitors through a glass partition. This room will accommodate the computer itself, a high-speed storage unit, console, paper tape reader, six magnetic tape stations, a high-speed punch, and an electromechanical printer. Adjoining rooms, each of about 400 sq ft, will house the tape library, document sensing, bill laminating, and equipment maintenance. All this space has a false floor to conceal cables.

Meter readings will be put into the computer with programmatic add punch machines. Information used by the add punches will be the account numbers produced in the same sequence as the meter book as a by-product of the computer in up-dating the master file. The machines will read in the account number automatically from the tape, then stop for entry of meter readings, demand, and other data. These readings will be keyed in manually for the present, pending development of a method for automatically transferring meter readings to the tape. The add punch machines, in combining account numbers and meter readings on tape for computer entry, will simultaneously compute control totals for accuracy verification of the readings.

The computer itself uses magnetic tape units and transistorized electronic circuits for rapid data processing. Its output is printed on paper forms by the 600-line-per-min printer. Address and billing information are printed in such positions that the chemically-treated paper can be folded, sealed, and trimmed for mailing as a postcard



BILLS PRINTED at 600 lines per min fold and laminate into postcard for mailing, include stub for payment record

Accounting and Customer Billing

by a Moore laminator and burster. Each card is perforated to provide a stub to accompany the payment.

Payments are read by a Farrington-IMR optical scanner at 100 stubs per min and fed into the computer on seven-level tapes. The scanner reads both account number and cash received, verifying both with check digits and recording total receipts in an accumulator for automatic entry in the tape at the end of each batch. This equipment provides flexibility to enter partial payments and special information through a keyboard.

Five programmers were selected for training by testing Tabulating and Accounting Department personnel. These programmers, aided by several manufacturer's representatives, were assigned computer runs in the customer accounting operation. Additional men from the Methods and Systems Department lived with the programmers during the development period to coordinate computer operations with business office requirements.

The manager of the existing Tabulating Department was selected to take over the new computer and was sent to the manufacturer's programming school. Following this training, he was installed in his new job to oversee the programming and to coordinate delivery of equipment and supplies and to train employees for the new center. He, and all others assigned to the project, were completely relieved of former duties. Vacancies in the Tabulating Department were filled by temporary assignment of personnel to keep this operation up to adequate strength.

A key-punch operator from the tabulating group was re-trained as a tapewriter operator. She helped create material for initial development of the accounting program and will become the "lead" girl for the new input section.

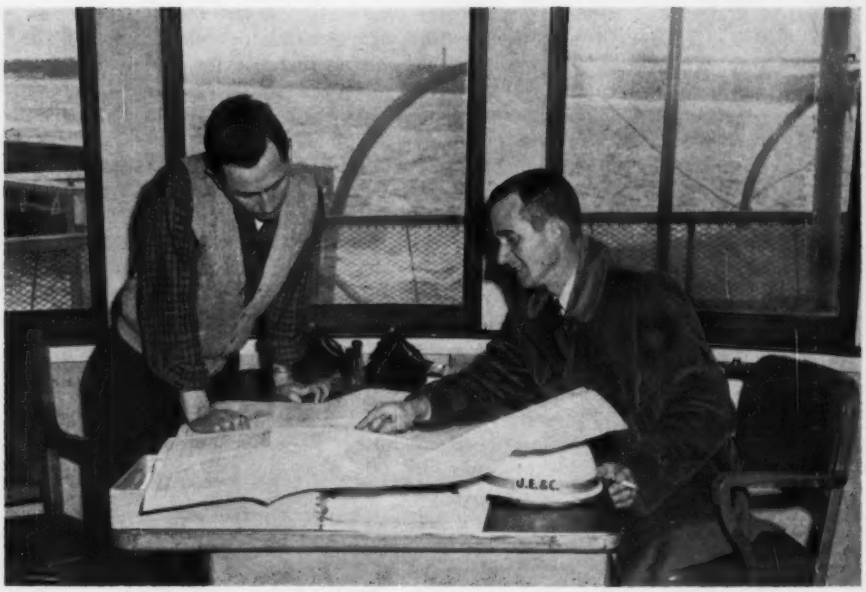
Most of the customer accounting runs have been completed and are now being de-bugged at the manufacturer's computer center. We expect to have these ready for parallel operation with the tabulating system as soon as the building is ready, preparatory to taking over the accounting at the new macility.

Thus Atlantic City Electric Co prepares for its second computation center, having outgrown a punch-card tabulating system in four years. Specifications this time called for magnetic tape equipment with capacity to handle 10 years growth, coupled with paper tape inputs and automatic re-entry of information. The new installation will be used initially for customer, payroll, and stores accounting but will probably find many additional uses after it goes in service.

OPTICAL SCANNER reads payment stubs into tape for input to the computer

Old Ferry Begins Construction

SS NIAGARA, once a ferry boat plying between Weehawken and New York's North River slips, serves Public Service Electric & Gas Co of New Jersey as a mobile construction headquarters. Here it begins new career at the Sewaren Generating Station

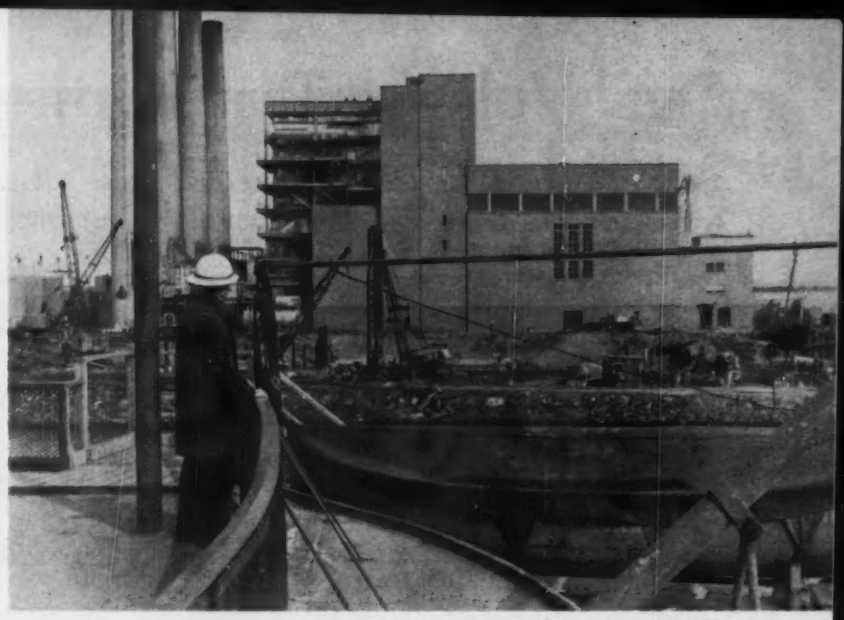


JOHN DMYTRYK, assistant superintendent of construction (seated), United Engineers, has a second-deck office which overlooks the Arthur Kill, at the open end of the doubled-ended ferry boat. Staten Island is on the horizon

CARPENTER SHOP occupies a Deck 1 area, the boat's walking beam having been removed and its metal casing cut through to provide space almost across the Niagara's 62-ft beam. The boat is 208 ft in length and has the usual three decks

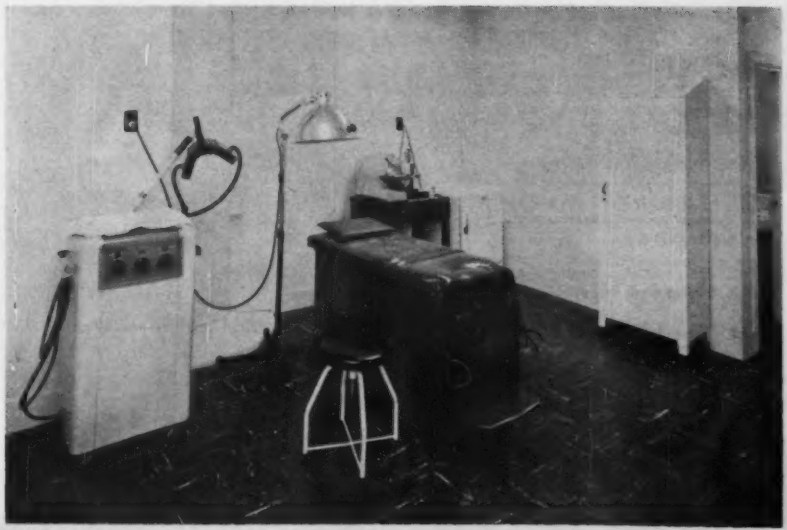
Career

SEWAREN STATION is adding a fifth generating unit, rated 342 Mw, for operation in 1962. Foundations are now being laid next to existing facilities by construction crews directed by United Engineers & Constructors, Inc, of Philadelphia, Pa.



DRAFTING ROOM, overlooking the construction site, is one of the facilities built into the half-century old boat's 18,000 sq ft of usable floor space. Use of boat obviates dismantling of the usual building when Sewaren job is completed

FIRST AID can be administered on Deck 1. Other boat spaces are devoted to machine, electric, pipe fitting, and welding shops. The boat was brought there by tugs and ground filled in on three sides. It can be floated to next jobsite



Dual-Voltage Transformers Save

2.4 x 7.2/12.17-kv units prove economical when SCE&G replaces 2.4-kv transformers in converting distribution

J. H. **GANTT**, Superintendent of Distribution, Charleston Division, South Carolina Electric & Gas Co, Charleston, S. C.

Dual-voltage transformers have become important in South Carolina Electric & Gas Co conversions to higher-voltage distribution. Even in areas not to be converted for some time, and now with money costing from 10 to 15% per year, SCE&G favors dual-voltage transformers.

Adapted from a paper presented at Engineering & Operation Section, Southeastern Electric Exchange, Atlanta, Ga., Oct. 15-16, 1959.

Although carrying charges for a year or two offset saving at cutover time, SCE&G is sold on other advantages. Usually, SCE&G conversions come under one of two categories:

- Areas to be converted immediately. These are areas already served at the lower primary voltage.
- Areas to be converted, where the lower primary voltage will suffice for a time.

In areas for immediate conversion, the 2.4-kv transformer is replaced with a 2.4 x 7.2/12.47-kv dual-voltage transformer, and the lightning arrester and, when necessary the cutout, are changed. Cutouts rated 7.8-kv are used for both 2.4/4.1-kv and 7.2/12.47-kv single-phase installations. It is not necessary to change the cutout unless an old installation with 5.2-kv cutout is encountered.

Areas to be converted to higher primary voltage later are new areas already on or near the 4-kv source, but within larger areas scheduled for later conversion to 12-kv. In such cases, the new distribution systems are built for 12-kv, and dual-voltage transformers are set. The low-voltage tap is used until cutover is made. The use of 7.8-kv cutouts at both voltages eliminates any later change. Should there be a summer between installation and scheduled cutover, the higher-voltage arresters are not desirable.

Table I compares the cost of converted with conventional and dual-voltage transformers in areas for future conversion. Definite saving favor dual-voltage transformers. Item 1 includes the cost of the original set of the 2.4-kv transformer, removal of the 2.4-kv unit, setting the 7.2-kv transformer, and reconnection on cutover day.

Table I—Costs Compared for Areas to Be Converted Later

	5 Kva	10 Kva	15 Kva	25 Kva	37.5 Kva
Set 2.4 Kv	7.72	13.66	13.66	14.85	20.20
Set 7.2 Kv (on back of pole with temporary rearranging)	12.04	17.82	17.82	20.03	27.16
Reconnection on conversion day	5.00	5.00	5.00	5.00	5.00
Remove 2.4 Kv	5.18	7.83	7.83	10.21	13.77
1. Total cost using conventional transformers	29.94	44.31	44.31	50.09	66.13
Cost of 2.4/7.2 Kv without taps	130.00	197.00	252.00	347.00	455.00
Cost of 7.2 Kv without taps	120.00	183.00	233.00	321.00	421.00
Difference—transformer cost	10.00	14.00	19.00	26.00	34.00
Set 2.4/7.2 Kv dual voltage	7.72	13.66	13.66	14.85	20.20
Reconnection on conversion day	2.00	2.00	2.00	2.00	2.00
2. Total cost using dual-voltage	19.72	29.66	34.66	42.85	56.20
3. Saving from dual-voltage	10.22	14.65	9.65	7.24	9.93

Reconnection Simple

The change-over procedure does not follow this sequence, as it is necessary to have both transformers on the pole until cutover. Item 2 includes setting the dual-voltage transformer in the original installation, difference in purchase price of dual-voltage and conventional transformers, and reconnection on cutover day. Reconnection, in this instance, requires only turning the tap changer handle and changing the fuse.

Item 3 shows the saving in favor of dual-voltage transformers. All labor costs are unit costs paid local line contractors and do not include equipment other than transformers. Undoubtedly, these figures would be somewhat less were SCE&G crews used. Transformer costs are June 25, 1959 prices.

Table II compares the costs of conversions with conventional and dual-voltage transformers in areas for immediate conversion. A definite

(*Continued on page* 108)

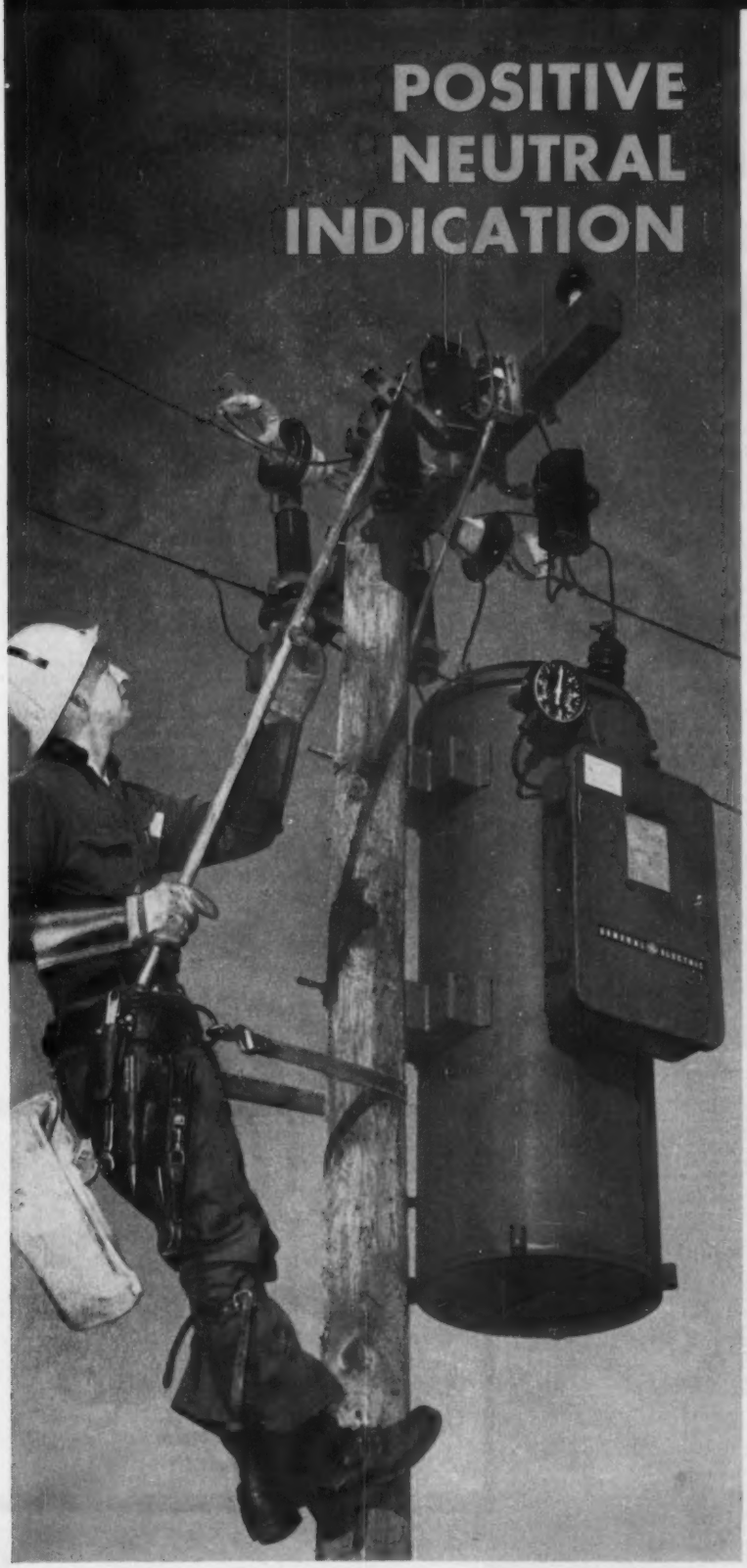
Table II—Costs Compared for Areas to Be Converted Immediately

	5 Kva	10 Kva	15 Kva	25 Kva	37.5 Kva
Remove 2.4 Kv	5.18	7.83	7.83	10.21	13.77
Set dual-voltage 2.4/7.2 Kv	7.72	13.66	13.66	14.85	20.20
Reconnection on cutover day	2.00	2.00	2.00	2.00	2.00
Difference (Table 1)	10.00	14.00	19.00	26.00	34.00
1. Total cost using dual-voltage	24.90	37.49	42.49	53.06	69.97
Set 7.2 on back of pole and rearrange	12.04	17.82	17.82	20.03	27.16
Reconnection on cutover day	5.00	5.00	5.00	5.00	5.00
Remove 2.4 Kv	5.18	7.83	7.83	10.21	13.77
2. Total cost of conventional transformers	22.22	30.65	30.65	35.24	45.93
3. Saving from conventional 7.2 Kv	2.68	6.84	11.84	17.82	24.04

NOTE: Installation costs include incidental wiring, but not cross arms, cutouts, arrestors, grounds or primary risers.

ANOTHER STEP AHEAD IN VOLTAGE REGULATION

POSITIVE NEUTRAL INDICATION



NEW

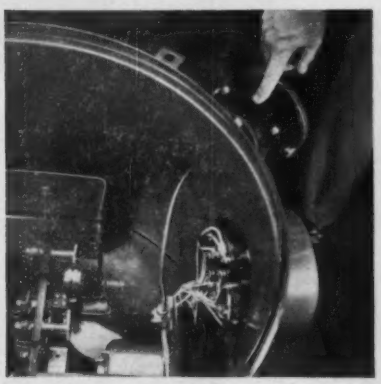
Mark-II position indicator for G-E voltage regulators protects lineman and equipment

Exclusive Mark-II Load Bonus position indicator and indicator drive system for General Electric single-phase step voltage regulators provide positive indication of tap-switch position. This gives more assurance against fear of injury to personnel or equipment when bypassing regulators on hot lines.

Linemen are aware that if a regulator is bypassed with the tap-switch off neutral position, the dead short created across part of the series winding can destroy equipment and seriously endanger the lineman.

It is important that operating personnel *know* that regulators are in the neutral position before bypassing. The new General Electric Mark-II Load Bonus position indicator provides this assurance.

New Mark-II position indicator system—standard on all G-E ML-32 regulators at no price premium—is an example of General Electric's continuing leadership in voltage regulators. This is another reason why G-E regulators cost less on the line. Ask your regulator representative for more information. General Electric Company, Schenectady 5, New York. 423-43



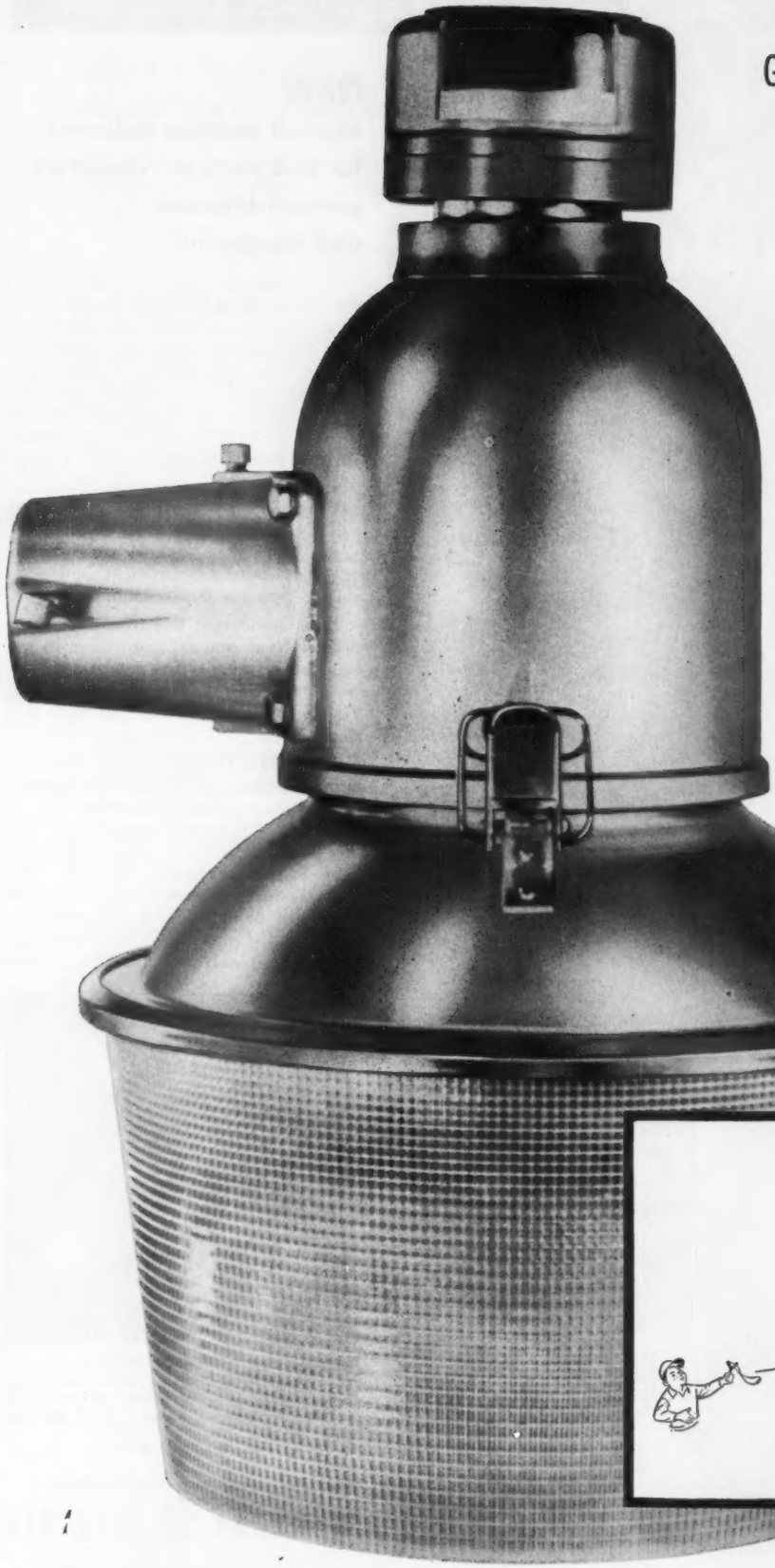
NEW MARK-II INDICATOR drive system eliminates possibility of indication error. Unique locking coupling and gear-driven indicator assure positive alignment of indicator hand and tap-switch position.

Progress Is Our Most Important Product

GENERAL ELECTRIC

GENERAL ELECTRIC'S

Boosts by



"PRIVATE-LIGHTING" PACKAGES Especially for "private-lighting" applications, General Electric offers the Acrylic-Suburban luminaire in attractively priced equipment packages:

Cat. No. C648G017—Acrylic - Suburban luminaire complete with cadmium-sulphide photoelectric control, acrylic refractor, hood with 175-watt built-in ballast (lamp not included), 4-foot aluminum bracket.

Cat. No. C648G016—Acrylic - Suburban luminaire complete with cadmium-sulphide photoelectric control, acrylic refractor, hood for up to 6000-lumen filament lamp, mogul base, 7-inch light center (lamp not included), 4-foot aluminum bracket.

NEW ACRYLIC-SUBURBAN LUMINAIRE

"private-lighting" profits cutting maintenance costs

Exclusive shatter-resistant plastic refractor tops money-saving features

Here's a luminaire designed and built to keep your maintenance trucks in the garage, and your "private-lighting" accounts on the profit side of the ledger. It's the new General Electric Acrylic-Suburban.

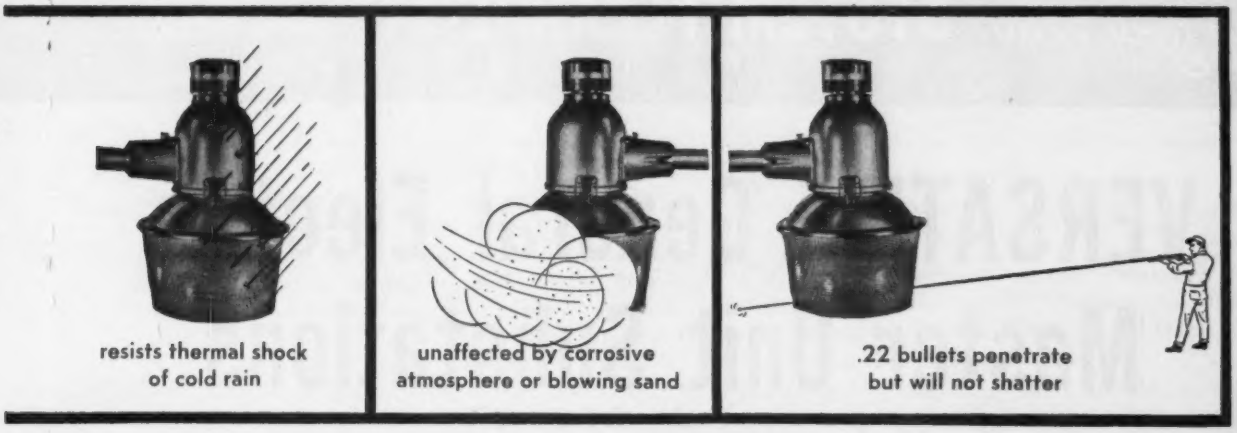
Realizing that repeated service calls can severely hamper any rural and suburban lighting program, General Electric has built into the Acrylic-Suburban these time- and money-saving features:

- The industry's first-and-only open refractor of durable plastic—virtually unbreakable in normal service—developed from General Electric's years of experience with acrylic refractors for mercury luminaires such as the M-250. This precision-molded refractor is more costly to make than glass and offers more resistance to all causes of breakage, yet you pay *no premium* in price. It has the same high transmissivity as glass, and is interchangeable with many standard glass refractors. One-fourth the weight of glass, it's far easier to install.
- General Electric's dependable cadmium-sulphide photoelectric control, which mounts right on the locking-type hood for automatic dusk-to-dawn operation. It's built and tested for years of reliable, trouble-free performance.
- Long-life ballasts built right into the hood for mercury lamps up to 250 watts (hoods without ballast for up to 6000-lumen filament). Since mercury lamps generally last two to three times longer than filament, this means far fewer service calls for relamping.

It all adds up to a luminaire you can install and forget. Whether it's for suburban streets, commercial establishments, or areas around private homes and farms, the General Electric Acrylic-Suburban can mean increased lighting profits for you. For full details and immediate shipment from stock, call your General Electric Apparatus Sales Engineer or Agent. General Electric Company, Outdoor Lighting Dept., Hendersonville, North Carolina. 460-01

Progress Is Our Most Important Product

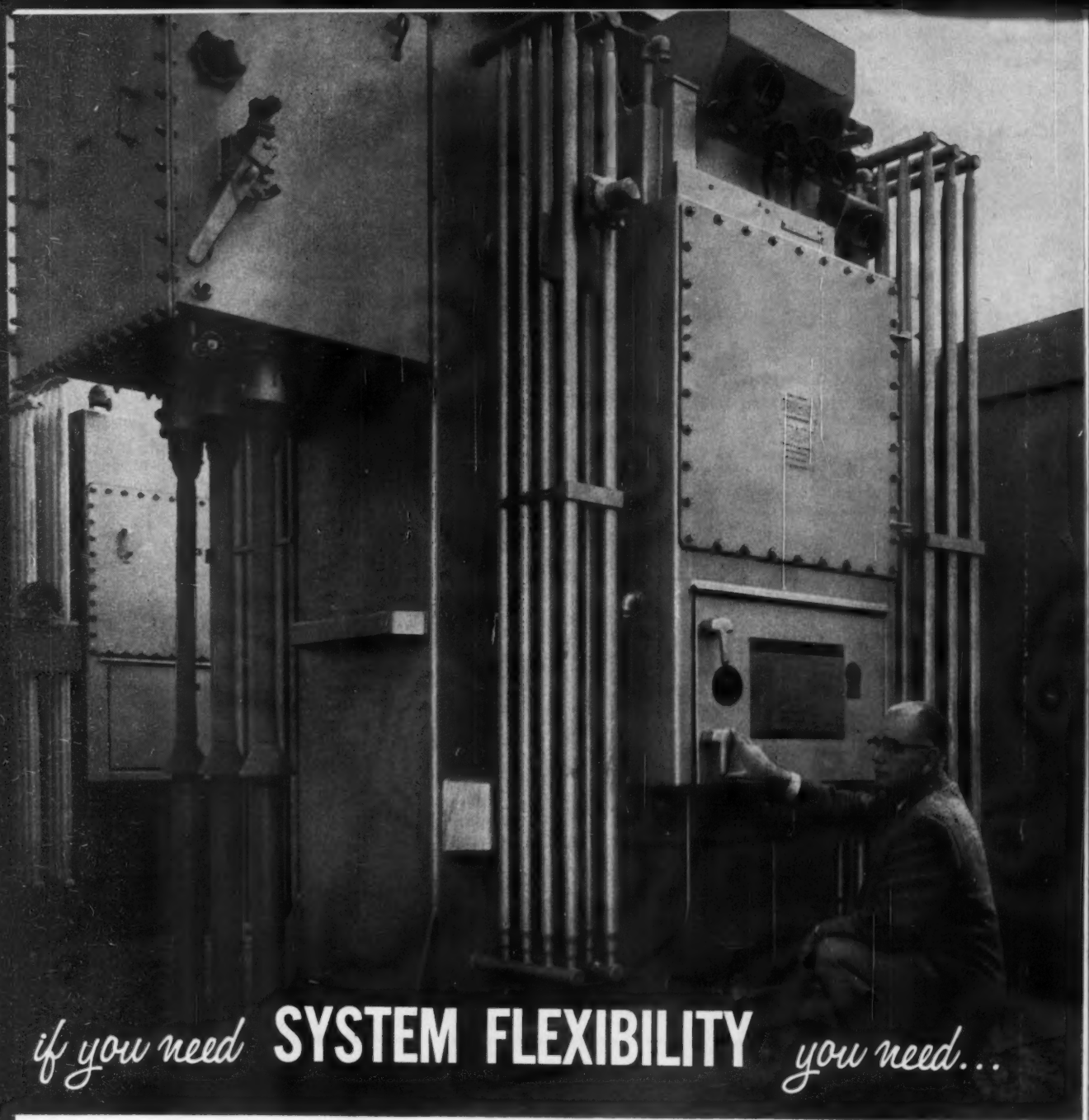
GENERAL ELECTRIC



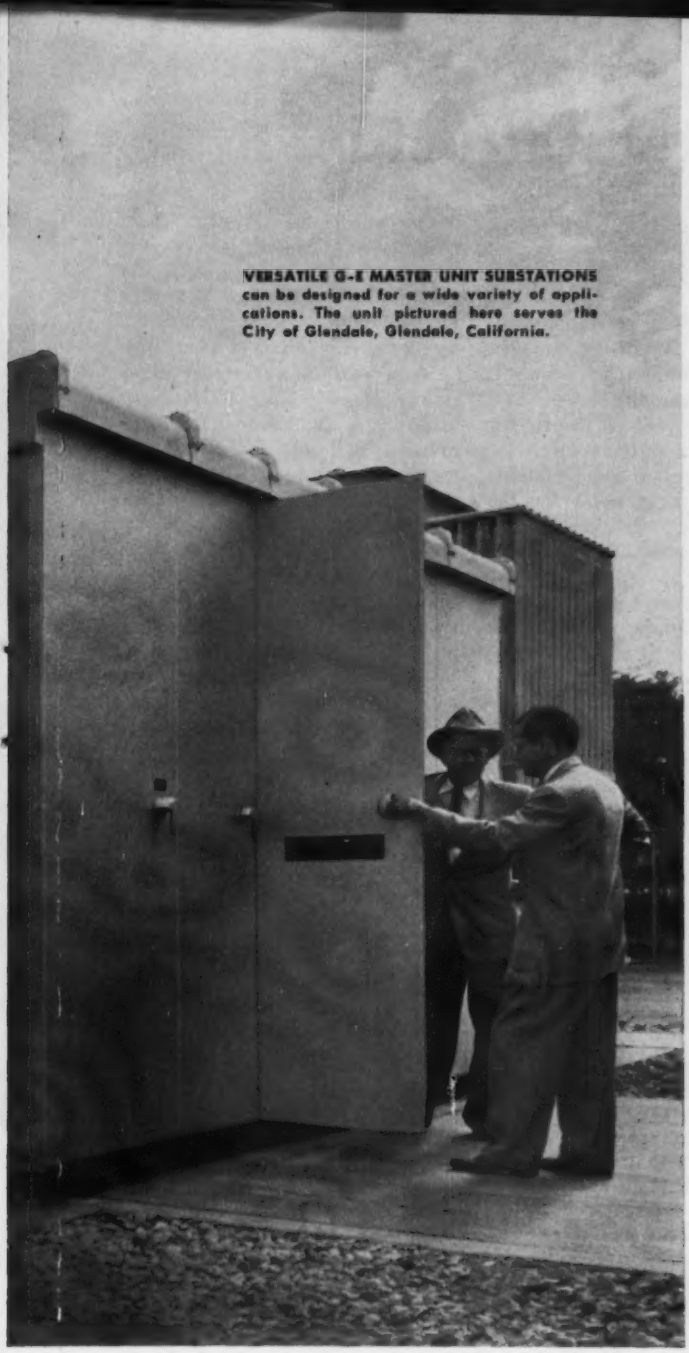
resists thermal shock of cold rain

unaffected by corrosive atmosphere or blowing sand

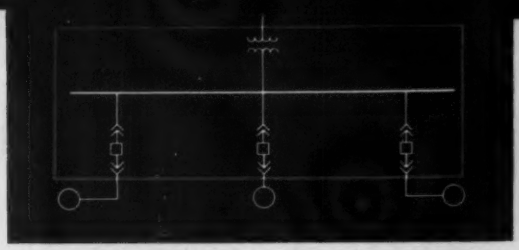
.22 bullets penetrate but will not shatter



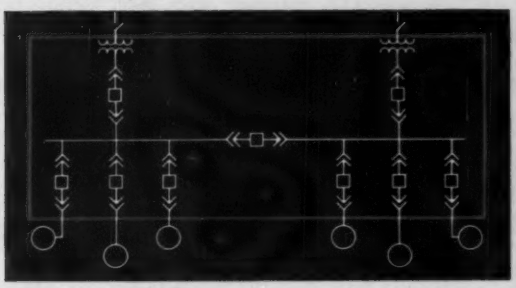
VERSATILE General Electric Master Unit Substations



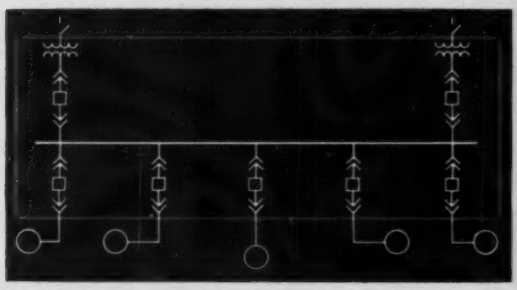
VERSATILE G-E MASTER UNIT SUBSTATIONS can be designed for a wide variety of applications. The unit pictured here serves the City of Glendale, Glendale, California.



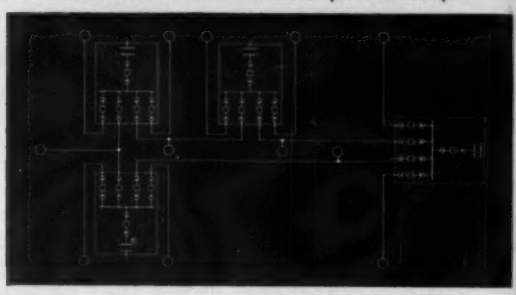
SIMPLE RADIAL ARRANGEMENT, utilizing General Electric Master Unit Substation, provides a basic "building block" approach for future system expansion.



LOW VOLTAGE SELECTIVE substations with system integrated Master Unit Substations are often used where projected load density is not too great and load density is not uniform.



SPOT NETWORK arrangements are another way that G-E Master Unit Substations can be used to assure system flexibility.



PRIMARY NETWORK arrangements offer high service continuity and load density. Flexible General Electric Master Unit Substations are easily integrated into this type of arrangement.

A wide variety of system arrangements are available with modern Master Unit Substations. Thus, these units are ideal to meet the need for power distribution flexibility which will grow more acute during the '60's.

For example, in the important area of providing for future load growth, versatile General Electric Master Unit Substations originally installed to serve as simple radial substations can be easily converted to supply the power requirements of primary network, spot network, low voltage selective or duplex distribution systems.

In addition to application versatility, quality-engineered components assure your system of the capacity, service continuity and protection it needs.

For more information on versatile Master Unit Substations, contact your nearest G-E Apparatus Sales Office or write for publication GEA-3800D, General Electric Co., Schenectady 5, New York.

511-34

Progress Is Our Most Important Product

GENERAL ELECTRIC

Modernize Your Rate Structure

Future public relations may depend on sound examination of today's rates; positive steps often need to be taken

T. L. **SHARKEY**, Manager, Rate Dept, Ebasco Services, Inc, New York, N. Y.

Successful handling of a tremendous growth potential by electric utilities as private enterprises may well depend upon how individual operating companies conduct pricing policies and customer relations. By taking positive steps now to formulate tomorrow's pricing policies, the industry will be better able to demonstrate that public interest will be best served if private enterprise provides the public's utility service.

Rate making and pricing must produce the revenue requirements of the utility that will enable it to provide adequate service to its customers and a fair return to investors. To develop the pricing structure for tomorrow requires a re-examination of past policies and a thorough understanding and appreciation of the underlying economic changes that are taking place in capital investment and operating phases. Briefly these are:

- Gradual increase in the investment cost per unit of facility.
- Substantial increase in the total dollar investment commited in the enterprise.
- Gradual increase in operating expenses per customer exclusive of production and transmission. For Class A and B Companies, these expenses, which are fixed amounts per customer regardless of use, have increased from $27.46 per customer in 1950 to $37.06 by the end of 1958.
- Decreasing load factors are occuring in many areas at a time when the magnitude of both the investment and megawatt capacities requires fullest utilization for economic operation.
- The fuel component of kwhr production costs is at a low level in spite of constantly rising fuel prices, owing to improved efficiencies found in present-day generating plants.

Utilities must start with and operate from the rate structure as it now exists; it cannot be changed overnight. The utility can, however, recognize the economic changes that are taking place and set targets for the rate structure of the future.

Three fundamental considerations need to be kept in mind for the rate making of tomorrow: Adequacy, Acceptance and Programming.

The rate structure must be productive of revenues necessary to keep the company financially strong. At the same time, the structure must be such as to aid in the development of greater utilization of the service; much greater than has been possible in the past.

Employees Must Understand

The rate structure must recognize the necessity of acceptance by the public. Operating in the goldfish bowl of regulation, no matter how right the rate structure may be technically, it may not produce proper public relations. Utilities will have to demonstrate that a rate structure which follows sound concepts can be made acceptable politically.

The rate structure must be understood by employees so they may feel that the tools with which they are working are adequate and enhance their ability to explain the working of the schedules to customers.

The third important target is programming—the ability to adapt the structure for smooth company operation. It is the recognition in practice of the desirability of a close-knit interdependence of economic research, pricing policy and sales effort.

To develop a pricing policy and over-all objectives for a modern rate structure requires adequate knowledge of the nature of the potential market. This involves research in areas of customer growth, buying power, customer needs, competition, value of service and, particularly, the type of loads or combination of loads which the customer may impose upon the utility system. If volume utility sales with improved net income are to be obtained, sales effort must be expanded to go hand in hand with a pricing policy that meets the economics of tomorrow.

Some years of experience in rate proceedings before commissions leads to the conclusion that periodic revisions of rates, working toward a target, are preferable to the long dry years of unchanged rates and then institution of a major rate case with all its attendant publicity.

The price structure of a utility under today's conditions must be a living thing. In many instances, utility service is being priced in the same manner as ten or fifteen years ago. Exceptions are to be found in the recent treatment of electric space heating. In most situations, rate adjustments were made as an aid to improving the situation that had been developing for some time; namely, the worsening load factor brought about by summer air conditioning. As we move toward serving the loads of the future and better utilizing tools we have for economic projection, load research and cost analyses, we should be able to anticipate some problems.

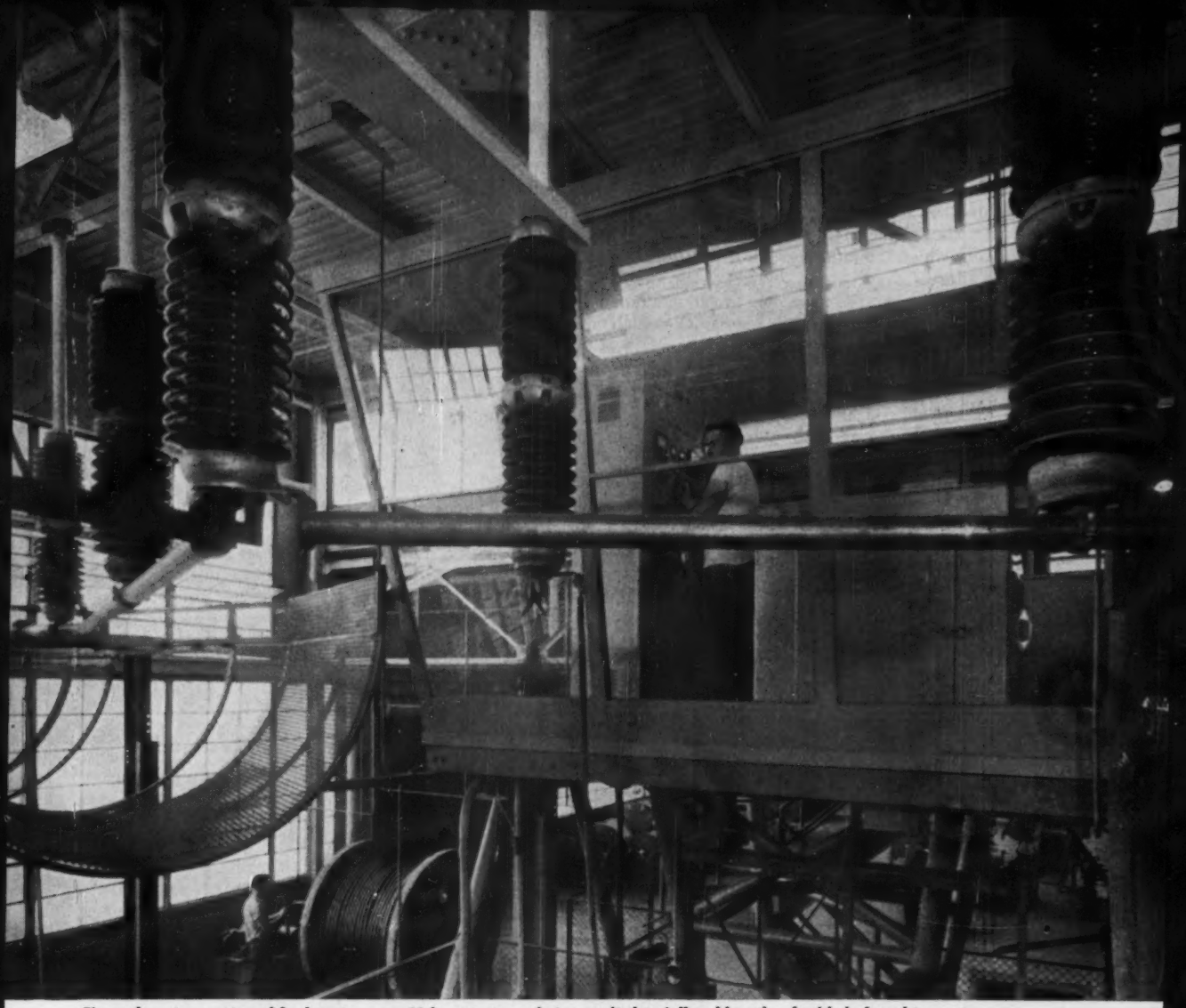
It must be recognized that pricing of the metered services is only a part of the problem of adding profitable loads. The cost of the equipment to the customer and of handling its financing must be given equal attention.

Nor can it be assumed that the utilization of the equipment, in which the customer has a substantial investment, and the maintenance of that equipment is something that can be left wholly to somebody else. Certainly the utility receiving an annual revenue of $300 to $400 per customer from the fully electrified home should be vitally interested in seeing that nothing impedes the continuity of this revenue.

I. Residential

Efforts should be made to provide service to one customer at one location through one meter and one bill. With present capital and oper-

(*Continued on page* 82)



Shown here is a section of final testing area. Voltage tests are being applied to *full reel lengths* of cable before shipment.

ANOTHER BIG REASON WHY YOU SHOULD CONSIDER ANACONDA BUTYL (AB) CABLE—

SPECIALIZED QUALITY CONTROL AND INSPECTION

From the start: Raw-material suppliers are required to submit certified test reports. Then, tests and sampling at our plant offer extra protection even before production begins. **To finish:** Here's the final inspection line where the finishing touches are applied and where every inch of cable is carefully inspected. Perhaps you already know that Anaconda test procedures are much above industry standards. But do you know that test voltages on Anaconda Butyl (AB) Cable are 125% of industry standards—that minimum corona level is 150% of rated voltage to ground?

Quality control at Anaconda is *more* than mere testing and inspection. It is built into every manufacturing step. That's why you can be sure your Anaconda cable will be of high quality—why you can be sure Anaconda Butyl (AB) Cable is the finest rubber-insulated cable you can buy.

Everything you need to know about Anaconda Butyl (AB) high-voltage cable is neatly summed up in a new booklet, DM-5903, "Anaconda High-Voltage Durasheath® Cable." For your copy, write to: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. *Reg. U.S. Pat. Off.

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

ating costs of extra metering devices, to say nothing of meter reading, accounting and collection; separate metering of loads of somewhat different characteristics at the same location is a luxury which the industry can no longer afford.

If an increase is needed, the most logical place to obtain it is in what is termed the "front end." There it is most productive of revenue for a small charge per customer, and it satisfies the political concepts of "across-the-board" increases. True, percentagewise it does not increase the large-use customer as much as the low-use customer and, therefore, it is in this area where commissions must be educated on the bare-bones economics of the business. This does not require elaborate analyses; a demonstration can be made of out-of-pocket expenses incurred before the meter has turned one cycle.

Residential pricing has been and probably always will be an evolutionary process. The recent introduction of winter-summer rates, all-electric home rates and the like, which have the objectives of improvement in over-all system load factor, is a sound but intermediate step.

Job Is Not Done

However, the job is not yet done. Special-purpose rates may be maintained for a while, but ultimately the practicability of rolling these rates together in a simple pricing structure should be considered. To those concerned about the long-term problem of space heating demands, a current study is being made on the feasibility of using a longer measured demand interval.

Where electric utilities are depending upon the terminal block of the existing simple block rate for revenue protection on summer air conditioning, there is a revenue loss potential under the "roll-in" concept. In this area studies should be made as to appropriate pricing levels and blocking which will provide needed revenue protection and, at the same time, permit lower terminal charges to allow the fullest use of service at any time of the year without consideration by the customer as to incremental cost.

Many of the residential schedules we have today still carry a substantial number of impediments to all-out selling. There are demand limitations, water heating restrictions as to size of tank and wattage, and the like. Consideration should be given to the abandonment of some of these provisions which restrict the customer's freedom of use.

In our judgment, the ideal solution is the so-called "floating-block" approach. Here a substantial number of dollars per customer is obtained before the floating block begins. Individual customer load studies may disclose that it is appropriate to shorten the length of kwhr block allowed for this purpose. Where analyses indicate it would be impractical to eliminate the existing off-peak control method of furnishing water heating service, it should be left in effect, restricted to present users and gradually phased out.

Many utilities are rendering free servicing to customers. There should be a realistic appraisal of the public relations aspect of this servicing versus the costs involved. In most cases today these costs are included in overall expenses and, therefore, are assigned to all ratepayers.

In a recent rate case in the Southwest, studies disclosed that the large number of connects and disconnects were confined to a small percentage of customers. The substantial expense for performing the service for these customers was spread over all ratepayers. Another study of delayed payment of bills disclosed that a relatively small number of habitual offenders were responsible for expensive accounting and collecting work.

Customer costs such as these, which are determinable, permit the establishment of a schedule of charges for the particular services rendered to the customers requiring them. To the extent these costs can be passed to those creating such costs, the utility would be reducing expenses currently assigned to all ratepayers.

II. Commercial, Industrial

In commercial schedules there are many areas where simplification can be made, especially in the intermediate blocks, which will aid in customer relations and facilitate greater use of service. The development of commercial space heating and cooking may be severely curtailed by too rigid adherence to existing price arrangements, originally designed for lighting loads.

Commercial service, the same as residential, needs higher front-end charges, but closer study of practical rate levels in the intermediate and terminal blocks is necessary in order to promote greater use.

Many utilities serve loads which are outside of the usual schedule specifications. The utility does not wish to turn away the unusual type of customer, nor does it wish to subject the basic structure available for all customers to a multiplicity of rates in an attempt to render the specialized types of service. In these situations, the use of riders modifying the basic rate schedule is still in good form.

III. Large Industrial Loads

A number of utilities are building power plants in areas where it is to be hoped that new load centers for industrial use will be created and thus provide a nucleus of a community with attendant residential and commercial business.

Many industrial rates in use today were designed upon the economics of yesterday. It is not unusual to find industrial rates with low terminal demand charges and high terminal kwhr charges of 8 to 9 mills, or even a cent. Companion with this pricing are often fuel adjustment provisions based on plant economies which are substantially outdated.

Experience in pricing these larger loads indicates that it is becoming more and more difficult to sell service where there are terminal energy charges of the order just discussed, and fuel adjustments which are not commensurate with present-day system conditions.

Progress is being made by some utilities in the establishment of what may be termed the backbone industrial rate. Schedules for this type of service can be and should be simply expressed. They should pro-

(*Continued on page* 84)

Still ANOTHER Cottrell Advancement By Western Precipitation...

UNIQUE "FULL-RANGE" RAPPER CONTROL PROVIDES ENTIRELY NEW STANDARDS OF VERSATILITY

Rapping Frequency... Rapping Intensity... Rapping Pattern
ALL EASILY ADJUSTABLE TO MEET OPERATING REQUIREMENTS

THE PROBLEM:

In the operation of Cottrell Precipitators it is necessary to remove the dust, fume or fly ash that has collected on the plates and cause it to be deposited in a hopper for subsequent removal from the Precipitator. The Rapping System should accomplish this removal with minimum disturbance to the already collected material (to avoid re-entrainment) and with maximum cleaning of the plates.

However, collected materials vary widely in their physical characteristics. Some are sticky. Some agglomerate readily and in thick layers without disrupting electrical operation. Still others have no tendency whatever to agglomerate, but form a sheet of loose particles on the plate.

There is no "typical" dust—no fixed set of conditions to be met. Yet the Rapper System must be readily adaptable to efficient dust removal, regardless of dust characteristics!

Above: Inside view showing unitized circuitry
Left: Unit with dust-tight doors closed

THE SOLUTION:

With so many variables to be compensated, unusually wide adjustability of the Rapper System has long been a prime objective for optimum operating efficiency. But complex factors have prevented its attainment until development of Western Precipitation's new "Full Range" Rapper Control.

By simply adjusting a few dials, "Full Range" Control permits:

- **FULL FREQUENCY ADJUSTMENT** from a complete rapping cycle every 50 seconds to one every 3½ hours... or any desired cycle in between!
- **FULL INTENSITY ADJUSTMENT** from zero to maximum over an unusually wide range!
- **FULL PATTERN ADJUSTMENT** 2, 4 or 8 impacts per cycle can be selected, with each cycle varying from light to heavy on successive impacts within the cycle—all automatically controlled to a choice of pre-selected operating limits!

Other Important Advantages...

Greater Safety: The "Full Range" Control has no dangerous high voltage circuits to endanger personnel. Entire unit is in "low-voltage" category.

All "Passive" Design: There are no motors, gears, or other high maintenance components in the "Full Range" Control. It is completely electronic.

Space-Saving Compactness: The "Full Range" Control requires about *half* the space of previous designs. Also is water and dust tight—can be located virtually anywhere.

Unitized Circuitry: All related parts are unitized into separate "cans" for simplified maintenance.

Free! **NEW BROCHURE** which describes and illustrates the new "Full Range" Rapper Control—the latest product of Western Precipitation's program of continuous advancement!

For quick assistance, call or wire collect our nearest office.

Only WP has All 6

1. COTTRELL Electrical Precipitators
2. MULTICLONE Mechanical Collectors
3. CMP Combination Units
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5. THERM-O-FLEX Hi-Temp Filters
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vide for bulk service, delivered at a location near the company's existing or contemplated backbone transmission system.

Use Facility Charge

If the industrial customer requires additional facilities for his operation or location, the charges for the facilities tailored to the customer's needs may be handled by a facility charge using, say, 14% or 15% for fixed charges on an annual basis, payable monthly. This process of handling large industrial loads allows great flexibility of action and, by the use of the facilities charge arrangement, permits a greater degree of tailoring the rate to meet the specific customer's requirements. At the same time, it does not impose the cost of the specific customer's requirements over the whole industrial class of business.

Profitable study may also be made of the possibilities of more fully developing the sale of scheduled off-peak power and interruptible power.

The prices for these services should be consistent with the degree of firmness as to hours of the day or months of the year that the service can be offered. In those systems that have a substantial seasonal valley, brought about by air conditioning, much can be gained by investigating the possibilities of making scheduled off-peak sales. To do this properly, a thorough knowledge and analysis is needed of the industrial operations in the service area, the type of prime mover, capacity, fuel and operating costs that are being incurred by these industries. Further, there must be complete understanding between utility and customer as to the operating details of arrangements so that there will be no recriminations when the "switch is pulled."

IV. Government Services

Services in the government and municipal category that concern utility operations are primarily those of street lighting and, more recently, the problems attendant upon servicing the express highways or thruways. There is a fundamental difference between municipal street lighting and service for the federally-financed highways or toll roads. With respect to the municipal street lighting, most of the companies have priced street lighting service with a very definite eye on local policy.

In the federally-financed expressways, utilities have already been or will be confronted with the question of service for access roads and service centers. In the federally-supported program, where there is a 90% grant, it is obviously cheaper for the road system to spend capital for utility facilities. The rate policy to be followed here should be that service will be rendered at one point of delivery through applicable standard general service rates and extension rules.

V. Protect Against High Costs

Modernization and simplification of rate structures cannot be discussed without considering that the utility should recognize economic changes and make needed adjustments to its price structure to fit them, by adequate and quick protection against rising costs which are readily determinable. The answer to this problem lies in a restudy and reappraisal of adjustment clauses aimed at the various elements of cost. The fuel clause is now in widespread acceptance and for many companies covers every kilowatt-hour sold.

Tax Clauses Vary

Many companies already have clauses to collect for the imposition of direct taxes; i.e., taxes on revenue or sales. A number of companies had tax clauses which would collect federal income taxes, although the coming of the Excess Profits Tax made these clauses impractical. Some companies are looking again at the clause which adjusts for increases or decreases in federal income tax rates or for changes in the method of computing the taxpayer's federal income tax liability. Many companies may be faced with increased federal income tax liability by a reduction by the Bureau of Internal Revenue of rates of accrual on depreciation for tax purposes.

Clauses to adjust for increases in wage rates have been tried. Some still exist but others have been dropped. Generally, labor costs depend upon the going rate for competitive skills and managerial ability to negotiate. It does not necessarily follow that the availability of an escalator clause in regulated utility pricing will in itself weaken management in labor negotiation. More and more wage settlements concluded this past year already have "built-in" wage increase provisions.

The principles behind these clauses are sound. It would appear that in operation there will be no insurmountable difficulties. Management must be ready to accept the full responsibilities that go with the operation of these clauses. Study indicates that they will work to the advantage of the company, the customer and the commission in its regulatory process.

Five-Year Expansion To Cost Half Billion

To finance a five-year construction program that will nearly double its capacity and cost about $485 million, Florida Power & Light Co will sell $280 million in securities this year. One issue will be in May and the other in November.

Robert H. Fite, president and general manager of FP&L, told the New York Society of Security Analysts the program will add 1,430,000 kw of new generating capacity to the present 1,648,000 kw.

Power plant expansion is based on anticipated sales of 12 billion kwhrs in 1964. This would be a 97% increase over 1959.

The company serves 729,000 customers now and expects to have more than a million by the end of 1964.

A new 240,000-kw unit goes on the line at the company's Port Everglades station in May of this year, and a second of the same capacity in May, 1961. Riviera station north of West Palm Beach gets a 300,000-kw unit, already ordered, to go on the line in the Spring of 1962. Another 300,000-kw unit will go into operation in the same station early in 1963. A 350,000-kw unit is proposed for 1964, with location to be determined.

New Money Makers for Industry:

KIN TEL CLOSED CIRCUIT TV SYSTEMS

what they are, and what they can can do for you...

What is a KIN TEL Closed Circuit TV system?

The basic closed circuit television system manufactured by KIN TEL consists of a camera, a camera control unit and a monitor (receiver) each connected by cable. The camera can be located at great distances from the monitor, and any combination of cameras and monitors can be used.

The camera is small enough to hold in your hand; rugged enough to operate in 150° F. without a protective housing; sensitive enough to provide excellent pictures of objects illuminated by only a candle.

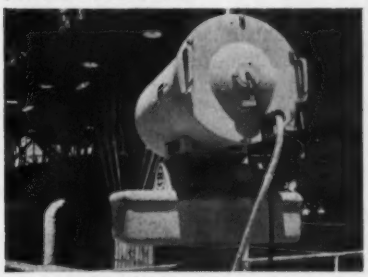
The camera control provides automatic operation. The system is continuously self-adjusting for wide variations in light levels (several thousand to one), and features automatic high definition of bright objects. The only control you have to touch is the on-off switch.

The monitor displays a crisp, clear picture...full 650-line resolution, twice that of the best home TV reception.

How are such systems used?

Today, KIN TEL closed circuit TV systems are performing a number of jobs for *hundreds* of firms, safely, inexpensively, tirelessly.

They are being used to watch operations or events that are tedious, difficult, dangerous, or even impossible for men to watch.



For example: Convair (above), Douglas, Lockheed and Northrop watch rocket tests with KIN TEL systems. U.S. Steel uses one to see inside open hearth furnaces. Westinghouse watches nuclear power reactor tests with one.

They are being used for surveillance.

For example: The San Francisco Naval Shipyard uses one to guard against pilferage.

They are being used for traffic control.

For example: The Alameda Naval Air Station uses a KIN TEL TV system to observe aircraft landings on the portion of the runway that is not visible from the control tower.

They are being used to transmit visual information quickly and accurately; for remote observation of charts, meters, graphs, schedules, blueprints, photographs, images from microscopes, fingerprints, signatures...the list is almost endless.

For example: E. F. Hutton uses a KIN TEL system to transmit stock market quotations to the offices of the firm's executives. The Los Angeles Department of Water and Power uses one for remote viewing of water-level meters. The University of California teaches physics with one.

They are being used for monitoring any operation that normally requires standby personnel.

For example: American Potash and Chemical (above) monitors conveyor line and warehousing operations with a KIN TEL TV system.

Why do these firms choose a KIN TEL system?

For a variety of reasons.

First, *reliability.* KIN TEL TV is designed for continuous duty operation in severe environments. Day in and day out, it keeps working. It's the first choice for ICBM and other missile programs that really depend on TV, that can't chance failure, that can't afford to compromise with reliability.

Second, *picture quality.* KIN TEL TV presents clear, sharp pictures. Full 650-line resolution provides maximum data...essential for *quantitative* observation of complex operations or transmission of printed material.

Third, *automatic operation.* KIN TEL TV is the only closed circuit system that provides entirely automatic, through-the-lens compensation for light-level changes of several thousand to one.

Fourth, the KIN TEL closed circuit TV system is extremely *sensitive.* The light required to read this page is enough for sharp clear pictures, and usable pictures can be provided with less than one-foot candle illumination.

Fifth, KIN TEL TV systems are *easy to install* and *simple to operate.* With no changes in lens iris to make, with no difficult, interacting electrical adjustments required, the only thing the operator has to know is the location of the on-off switch.

Sixth, a *complete* line of shelf-item system components and a variety of cameras and monitors make virtually any application feasible...permit observation of nearly every kind of operation, under all kinds of conditions.

For example, with system components, you can remotely position the camera, remotely select one of several lenses, remotely "zoom" in or out for closeup or wide-angle viewing, operate the camera in extremes of temperature or in explosive or dusty atmospheres, view microscope images. Whatever your viewing problem, KIN TEL probably has a *stock* solution.

Seventh, you don't have to waste your time and money on application engineering. At no obligation to you, KIN TEL's nationwide factory-trained field engineers – thoroughly experienced in optics, environmental requirements, lighting, cabling, human engineering factors, and other installation considerations – can determine whether or not closed circuit TV can be put to profitable use in your intended application.

What can a KIN TEL system do for your business?

It can do what it is doing right now for hundreds of other firms. It can save you time and money...increase efficiency...better your service to clients and customers. To find out how, write direct for catalog 6-103 and the name of your nearest KIN TEL engineering representative.

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A DIVISION OF
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ELECTRONICS, INC.

KIN TEL—pioneer and leader in closed circuit television.

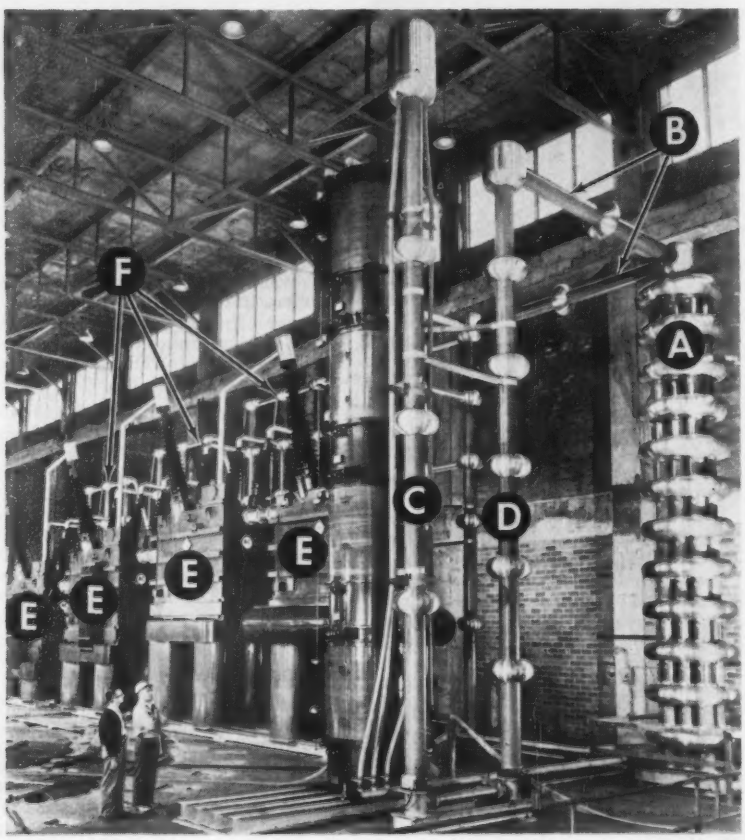
600-Kv Dc Supply Meets Rigid Specs

L. E. NICKELS, Design Engineer, Rectifier Section, Allis-Chalmers Mfg Co, Milwaukee, Wis.

A 600-kv dc power supply system with rigid design requirements was installed recently for Union Carbide Nuclear Co's nuclear fusion research program.

The power supply has a full load current of 1 amp. Other provisions are: voltage ripple of less than 1% rms; voltage regulation to within ±0.8% for any preselected voltage; ability to withstand intermittent short circuits of the dc load; voltage adjustable from 100 to 600 kv; flexibility that will permit conversion of the equipment to 900 kv by adding stages; and the ability to deliver 2 amp continuously at voltages less than 300 kv.

A complete dc substation was designed to provide the specification requirements. It contains ac switchgear, an AFR voltage regulator, vacuum switches, silicon diodes, a dc voltage filter and transformers for converting the incoming 3-phase, 13.8 kv ac to 496 kv ac rms, which will produce 600 kv dc at full load.



RECTIFIER SUBSTATION for nuclear fusion research dwarfs onlookers. Lettered components include filter capacitor (A), filter resistor tubes (B), bleeder resistor tube (C), and voltage divider resistor tube (D). There are four cascaded rectifier transformers (E) equipped with silicon diode rectifier tubes mounted atop each unit (F).

Four HV Transformers Used

Four conventional high voltage transformers, connected in cascade, were used. Each transformer supplies a 3-phase, full-wave, bridge-connected silicon rectifier. Individual bridges are rated at 150 kv dc at full load current When all four bridges are connected in series, a resultant dc voltage of 600 kv is produced. A dc voltage of 900 kv can be obtained by adding two transformers and two bridge-connected rectifiers in series with the 600 kv supply.

All silicon diodes, resistors, and stand-off insulators are mounted in, or are made from, a phenolic tube which is identical, except in length, for all three applications. This tube not only serves as a container for the diodes and resistors, but it also becomes part of a cooling oil recirculating pipe line.

A transformer type oil was used for insulation, prevention of internal corona and cooling of silicon diodes and resistors. All phenolic tubes have matching flanges and gaskets for easier field installations.

Power Supply Is Versatile

The power supply can be built in a relatively short time, and it has a long life potential. Voltage can be increased easily beyond 600 kv to meet future needs. Versatility provides any dc voltage that may be required. No special filament transformers are necessary for filament voltage at different dc potential levels.

Transformer bushings for the lower voltage cascaded transformers are more readily available than they would be if a single special high voltage transformer were used, as high voltage bushings are often custom built.

Save motor repair time with silicone rubber coils from National

... The Specialists in electric coils/repair service

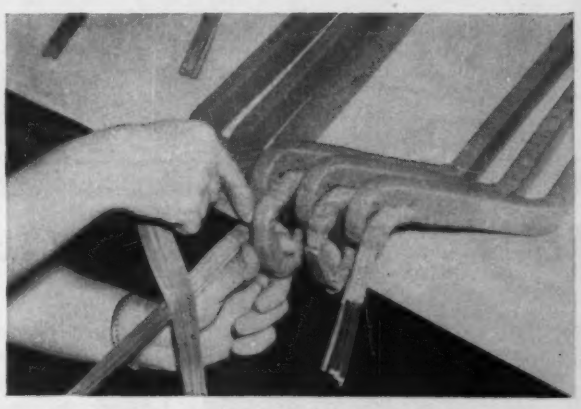
When rewinding motors—particularly those in wet, abrasive or conducting-dust applications—consider the advantages of silicone rubber insulation. Silicone rubber is resistant to water and chemical fumes and is tough and abrasion resistant.

When you order silicone rubber insulated coils from National, you'll enjoy these general advantages of longer life and reduced maintenance—*plus* these special National features:

—National custom makes each coil to exact dimensions, thus ensuring easy installation and eliminating the need for slot liners.

—National uses silicone rubber for insulating the connections so there are no weak points in the system.

Get National's recommendations. Since we either make or use all types of insulation, our recommendations are impartial—based solely on what's best for your application. For more information, call our Columbus plant, HUdson 8-1151, or the nearest National field engineer.



Insulating of connections with silicone rubber insulation.

National Electric Coil

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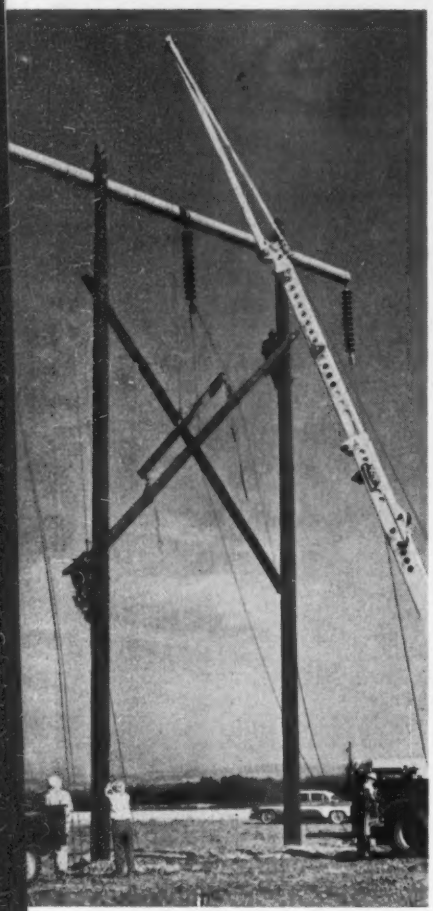
Electrical Engineers • Manufacturers of Electrical Coils, Insulation, Lifting Magnets
Redesigning and Repairing of Rotating Electrical Machines

McGRAW EDISON

Field Test Metal Crossarms



METAL CROSSARM is expected to have a longer, maintenance-free life than standard wood crossarm

To develop maintenance-free H-frame transmission structures, Portland General Electric Co has installed tubular metal crossarms on a new 230-kv wood pole line. Three types of metal arms are being tried—aluminum, galvanized steel, and spiral-welded steel with a special zinc coating. Expected advantages are longer life, lighter weight, and easier installation compared with wood.

PGE has used wood crossarms on 230-kv since 1956, but reports from other utilities indicated severe decay experience. The only solution to rot-deterioration of wood arms is replacement, which requires much time and effort. Metal arms should eliminate the need for replacement. The types of arms being tried should not need painting.

Erection of the 4.3 miles of 230-kv line provided an opportunity to try metal crossarms. Cost of the line exclusive of right-of-way is expected to be $147,000. This is a little higher than a line with wood arms, but overall costs should be lower.

The metal crossarms used include 11 galvanized steel, 10 spiral-welded steel and 14 aluminum. All are lighter than the normal 1,200-lb wood arms. Among the aluminum units were eight 41-ft tangent-structure arms, three 36-ft and three 25-ft angle-structure arms.

Dimensions of Metal Arms

Galvanized Steel	820 lb 41 ft long 10-in. OD
Zinc-coated Steel	580 lb 40 ft long 13⅜-in. OD
Aluminum	350 lb 41 ft long 9½-in. OD

Crews who erected the structures said they preferred working with metal crossarms, in part because hardware arrives attached to the arms. Using a hydrocrane, a crew put up each crossarm with braces in just one hour.

PGE plans to use metal arms for most future 230-kv construction and is considering their use on 115 kv. No preference has yet been established among the three types. The use of metal poles is also being studied. The metal arms were designed to specifications drawn up by PGE engineers with the cooperation of manufacturers' representatives.

Quiet Fork-Lift Uses Warning Bell

Quiet operation and freedom from fumes are features of the electric fork-lift trucks which Oklahoma Gas & Electric Co is using in the storeroom at the new service headquarters. In fact the trucks were so quiet that operators had trouble getting the way cleared. People working in the storeroom did not hear them coming and would not step aside as they had done in the past.

To solve this problem OG&E installed a bell on the front left wheel. The bell dings continuously when the truck is in motion. While the operation of the trucks is still quiet, the bell warns other workers in the area and they clear the way for the fork-lift.

(*More Methods on page* 90)

KNOW-HOW

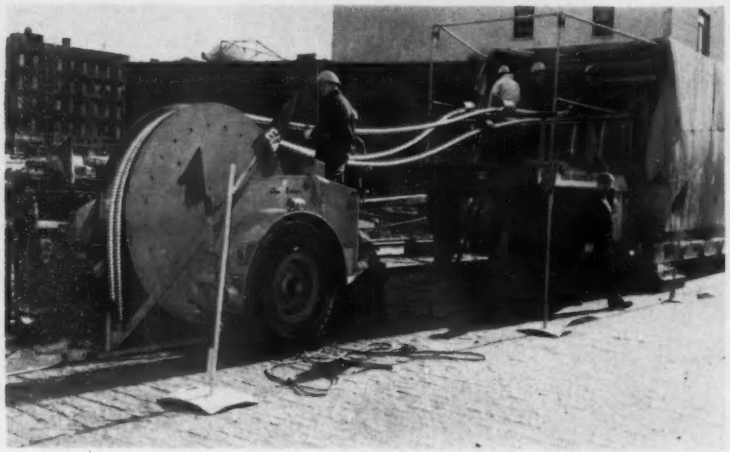
Victor 900 Suspension Insulators (EEI-NEMA, TDJ52-3) are universally used by utility men because they're rugged and built to last.

Looking at a VICTOR Suspension insulator, you'd think it was an easy item to manufacture. It isn't. You don't just stamp them out like cookies, bake them in an oven and presto—insulators. No, a lot of research, engineering and manufacturing know-how over a long period of years is required to produce insulators that have uniform performance characteristics and far exceed EEI-NEMA standards.

VICTOR has an enviable reputation for knowing how to make insulators that are superior in performance under the most gruelling conditions of service. Many a power man has decided to play safe . . . and choose VICTOR. For catalog, specifications and prices, contact your nearby Victor sales office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

3-Reel Trailer Speeds Cable Pulling



Cable-pulling operations are further mechanized for Consolidated Edison's field construction forces through the use of a new trailer frame for transporting reels of transmission cable. The revamped trailer simplifies operations by reducing the use of motorized equipment, saves time, and reduces manpower requirements. Through it Con Edison hopes to considerably lower the cost of its 138 and 69-kv transmission system expansion.

The trailer frame is designed to carry three reels of cable on one trailer loaded at the factory. Formerly, two trailers were needed to haul three reels to the job. A crane no longer is required during operations because the cables can be fed directly from the trailer to the manhole.

Pulling operation covering two sections of cable formerly required 10-12 hr; now it is done in less than 8 hr. In addition, use of the revamped trailer makes cable-pulling a straight-line operation, requiring only one lane of traffic space.

With the reels set on the trailer, there is no danger of their tipping over, particularly during operations on streets with uneven surfaces. The trailer is 44 ft long, 10 ft wide and 13 ft, 2 in. high with a carrying capacity of 44 tons. A canvas cover protects the cable from rain and snow. Techboard, which is less costly and takes less space than the double lag-sticks formerly used, also protects the cable from dampness. Two trailer frames have been placed in operation by Con Edison's Outside Plant Construction Dept, with at least two more to be added.

Improved Epoxies Handle Many Repairs

W. H. STRATTON, Line and Station Supervisor
JACK AKERS, Station Foreman, Appalachian Power Co, Williamson, W. Va.

Many maintenance jobs are made both simpler and less expensive through use of improved epoxy resins. Results from experimental use in sealing transformer leaks were so outstanding that further tests, all successful, were made in repairing plastic tube, bushings and glass.

In general, epoxy resins form a very strong bond to metal, glass, porcelains, etc. Epoxy compounds come in two parts, the resin and the catalyst. Hardening does not take place until these are mixed on the job to begin the chemical reaction. Some single-element epoxies are available, but heat is required to cure them.

However, epoxies do not make a good bond with rubber-like materials; some of them do not withstand mechanical shock; and temperature limitation for most is around 300 F. But if care is taken and the proper resin compound is used for each job, they provide invaluable maintenance aids. Some applications are:

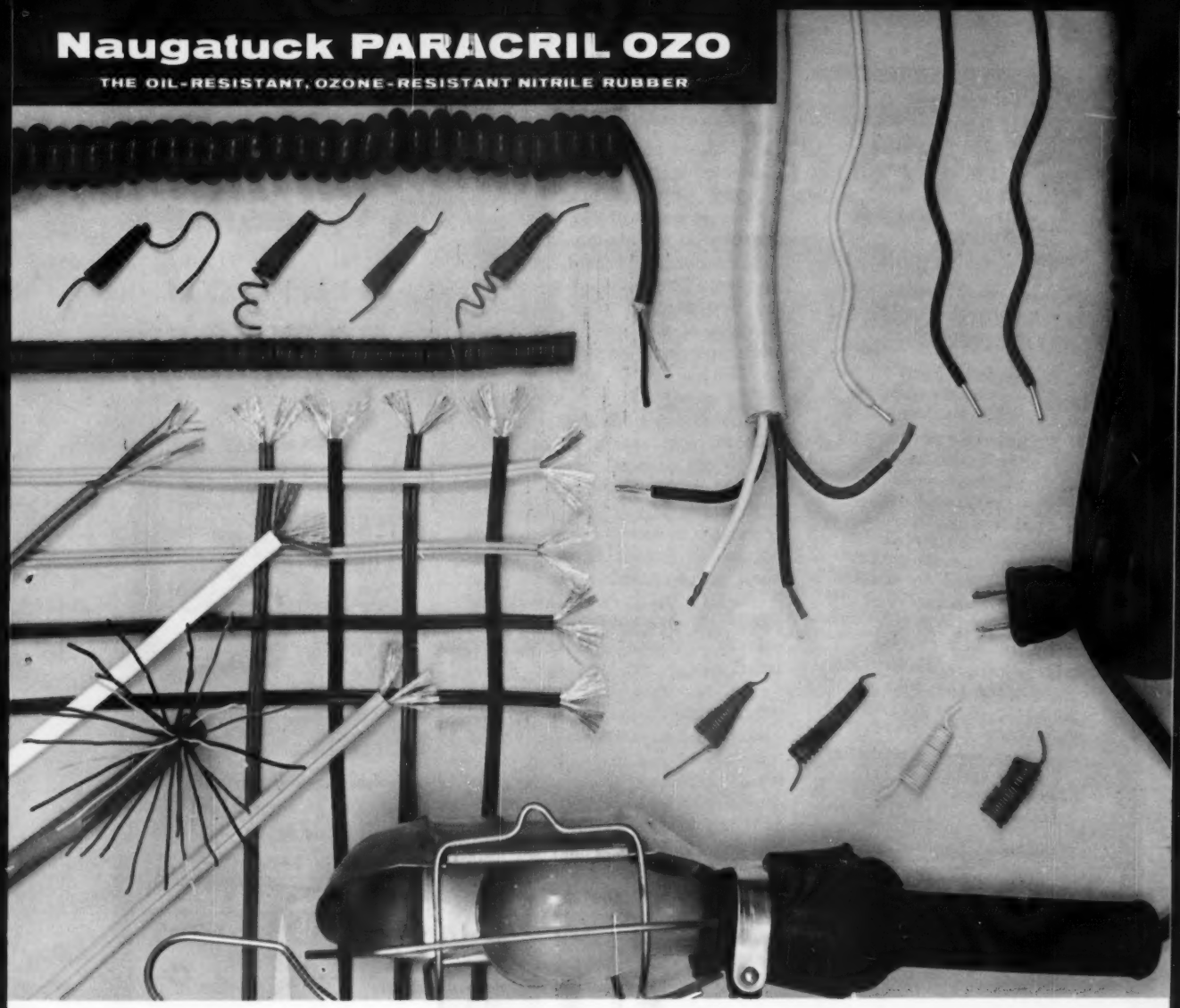
EPOXY RESIN stopped a leak in the drain valve nipple for only $4.50

1. A slight leak around the base of the nipple in the well of a 46-7.2-kv, 500-kva transformer was repaired, as illustrated. In-service repair with an epoxy cost $4.50; the usual welding repair would have cost about $150, with the transformer out of service to do it. The surface first was cleaned thoroughly with Varsol down to base metal.

2. A leak in the bottom of the cooling fin of a 250-kva, 46-4-kv transformer was repaired using an epoxy. After the hole was reamed to ¼-in. diameter, a wooden plug was tapped in and an epoxy applied with the transformer in service. Use of the epoxy cost $8.50; welding would have cost about $200.

Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



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Color code for fast, unerring identification . . . color for smart, modern appearance . . . to call attention . . . to hide . . . to add solid new sales appeal. Because PARACRIL® OZO takes and retains any color you desire, permanently.

In addition to color, PARACRIL OZO offers such advantages as:

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- exceptional abrasion resistance
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Try new PARACRIL OZO. See why it offers makers and users of not only wire and cable jackets, but of rubber products by the hundreds a host of valuable new selling possibilities. For more information, for samples, for technical assistance with a present or proposed application, contact your Naugatuck representative or the address below today.

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"Superformed* spells S-A-F-E-T-Y to a SAFETY SUPERVISOR"

"We Safety Men must look at any piece of equipment from the *safety* angle.

"Fanner Superforms? Sure, they are safer for our linemen to handle. Not unwieldy . . . no tools required for dead-line application . . . easily controlled with hot-line tools . . . ends are carefully machined to prevent rubber-glove puncturing . . . safer than straight wires and aluminum ribbon."

Everywhere, Safety Engineers, *the men who guard the safety of people*, have a good word for Superforms.

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FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

Small Computer

(*Continued from page 69*)

clerical labor previously doing interchange billing for other work in the company. Other real benefits include the improvement in consistency and accuracy in calculating interchange costs, and faster preparation of billing data. The previous system did not lend itself to other than spot-checking of the work of the group, and encountered the usual personnel problems.

The speed of the computer in doing the required billing work leaves time for other work on the computer. An economic dispatch program is available if the dispatchers require the answer to uncommon generation problems associated with outages of generating units or tie lines. An economic study program is used to study future loads and equipment and to determine the value of purchasing spinning reserve, actual energy, etc.

We are optimistic about the future of the computer and feel that it is a most valuable adjunct to the functions of the dispatching office. It is expected that engineering studies such as load flow, short circuit, sag and tension calculations, etc. will be programmed for computer solution. It is expected that the small digital computer will develop as a real operating tool in the hands of the operating and engineering people of Boston Edison Co.

Co-ops Do Better on Safety

The safety record for electric cooperatives throughout 1959 was better than a year ago, the Rural Electrification Administration told Electrical World. Only 13 deaths occurred through Nov. 17, compared with 29 at the same point in 1958. A total of 30 fatalities were reported for 1958—23 of them caused by electric shock and burn.

REA has increased its efforts to underscore the importance of safety. Several pamphlets have been prepared and safety is being stressed in REA Administrator David Hamil's speeches and at regional co-op meetings. The agency has three safety experts constantly on the road advising co-ops and aiding with the organization of safety programs.

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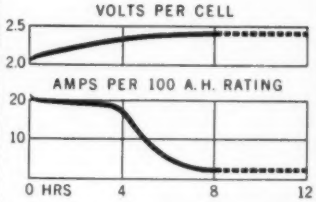
SILICON BATTERY CHARGERS

Stepless charging from start to end.
Less gassing, **less** heat,
longer battery life!



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Get the Complete Story in the New Christie Catalog Write for Bulletin BC-60

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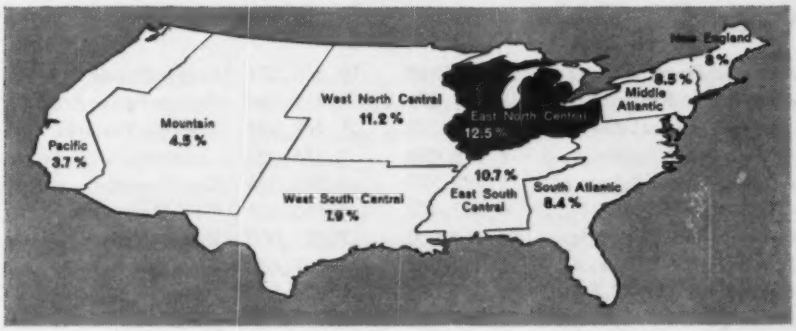
Proven Quality through 30 Years of Battery Charger Manufacturing

East North Central Utilities Lead as . . .



Net Incomes Climb 9% in '59

Report on
Utility Earnings

1959 went into the books as the best year ever for the electric utilities. Net incomes rose 9% over 1958 levels, on the average, based on an EW sample of 144 companies (collectively, accounting for 95% of total electric revenues). Operating revenues rose 8.6%. Rate increases, accounting adjustments, and good business conditions were largely responsible for the rise, in urging net incomes to pass the $1.5 billion mark for the first time. Gains were made by 9 out of 10 utilities, despite rising operating costs, and higher state, local, and federal taxes.

The East North Central region led all others with a net income climb of 12.5%; a sharp comeback from its next-to-last position the year before (when net rose only 3.4%). Several big rate increases on the largest systems were largely responsible, although the region's heavy industry, picking up momentum in its first full, post-recession year, undoubtedly had an effect. Close by, the West North Central region made an equally spectacular comeback in 1959 with an 11.2% net income gain. It had run dead last the year before, with utility net incomes up only 0.4%. The big gains in both regions, however, were made easy by a none-too-vigorous 1958.

The Pacific region, which in 1958 had led the pack, brought up the rear in 1959 with an average net income gain of only 3.7%. Although almost every utility in the Pacific region reported percent gains exceeding the national average, the regional average was held down by Pacific Gas & Electric Co. PG&E's net rose less than 1%; dollar-wise, it accounts for about half the utility net income for the entire Pacific region, and thus has strong leverage on the regional average.

The biggest dollar increase in net income was reported by Chicago's Commonwealth Edison Co, for the second year in a row. Commonwealth Edison upped its net $8.9 million, to a $72.4 million total for the year. Consumers Power Co was runner-up, with an absolute gain of $5.7 million, nourished, in part, by a $6.8 million-a-year rate increase, effective June 8, 1959. Wisconsin Electric Power Co and Potomac Electric Power Co shared third and fourth place honors, respectively, in largest net income advances.

Here Are Net Incomes for 144

COMPANY	1959	1958	COMPANY	1959	1958
Alabama Power(a)	20,383,528	18,570,374	Florida Power	11,501,463	11,166,217
Appalachian Power(a)	19,021,572	19,419,064	Florida Power & Light	27,064,440	24,773,027
Arkansas-Missouri Power	1,277,313	1,240,093	Georgia Power(a)	21,090,990	19,501,140
Arizona Public Service	7,878,000	7,376,000	Green Mountain Power	683,540	739,466
Arkansas Power & Light(a)	9,282,270	8,293,524	Gulf Power(a)	3,652,500	3,195,943
Atlantic City Electric	6,585,408	5,856,953	Gulf States Utilities	16,022,692	14,076,404
Baltimore Gas & Electric	20,966,000	17,925,000	Hartford Electric Light	6,799,000	6,415,000
Bangor Hydro-Electric	1,412,047	1,197,477	Hawaiian Electric	3,836,830	3,173,463
Blackstone Valley G & E(b)	2,080,064	1,824,148	Housatonic Pub. Svc.	925,809	914,095
Boston Edison	12,968,302	10,952,075	Houston Lighting & Power	20,923,010	20,208,138
Brockton Edison	1,596,997	1,392,142	Idaho Power	7,761,708	8,085,284
California Electric Power	5,607,904	4,909,235	Illinois Power	19,420,939	15,566,368
California-Pacific Utilities	1,064,564	882,545	Indiana & Mich. Elec(a)	14,082,601	10,627,226
Carolina Power & Light	13,194,358	12,274,283	Indianapolis Power & Light	9,289,725	8,420,534
Central Hudson G & E	5,427,224	4,677,523	Interstate Power	4,358,180	3,969,565
Central Illinois Electric & Gas	3,882,908	3,393,651	Iowa Electric Light & Power	4,836,611	4,255,981
Central Illinois Light	6,273,258	5,263,140	Iowa-Illinois Gas & Electric	6,372,500	5,317,574
Central Illinois Public Service	10,431,190	9,942,899	Iowa Power & Light	5,042,829	4,974,422
Central Louisiana Electric	3,372,684	2,980,657	Iowa Public Service	4,299,973	3,905,755
Central Maine Power	6,883,533	6,525,171	Iowa Southern Utilities	1,940,173	1,735,662
Central Power & Light (a)	10,257,783	9,479,196	Jersey Central P & L(a)	7,771,096	6,779,464
Central Vermont P S	1,741,325	1,640,812	Kansas City Power & Light	10,280,582	10,158,199
Cincinnati Gas & Electric	16,766,798	15,757,355	Kansas Gas & Electric	6,981,467	6,474,332
Cleveland Electric Illum	21,165,650	18,680,183	Kansas Power & Light	8,678,624	7,141,273
Colorado Central Power	833,190	701,824	Kentucky Power (a)	1,494,561	1,424,235
Columbus & Southern Ohio	7,699,541	6,692,637	Kentucky Utilities	8,274,500	7,272,826
Commonwealth Edison	72,452,964	63,502,223	Kingsport Utilities(a)	449,175	425,281
Community Public Service	1,885,698	1,626,984	Long Island Lighting	18,716,000	16,971,000
Connecticut Light & Power	13,564,000	12,709,000	Louisiana Power & Light(a)	7,586,120	6,973,309
Consolidated Edison of N. Y.	68,764,369	65,357,119	Louisville Gas & Electric	10,108,417	9,192,704
Consumers Power	37,254,908	31,524,062	Lynn Gas & Electric(b)	831,153	854,194
Dallas Power & Light(b)	9,719,502	9,380,641	Maine Public Service	787,191	748,791
Dayton Power & Light	10,581,000	10,542,000	Merrimack-Essex Elec.(b)	2,037,787	1,858,709
Delaware Power & Light	8,099,648	7,447,020	Metropolitan Edison(a)	9,177,335	8,729,842
Detroit Edison	33,429,785	30,101,310	Minnesota Power & Light	4,327,434	4,579,136
Duquesne Light	21,445,990	20,928,605	Mississippi Power(a)	3,465,553	3,175,935
Edison Sault Electric	338,149	301,060	Mississippi Power & Light(a)	5,749,116	5,039,510
El Paso Electric	3,755,558	3,341,695	Missouri Power & Light(a)	1,700,551	1,727,387
Empire District Electric	2,024,120	1,832,313	Missouri Public Service	2,451,775	2,052,874
Fall River Electric Light(b)	1,008,238	826,534	Missouri Utilities	647,506	623,132

Operating Electric Utilities*

COMPANY	1959	1958
Monongahela Power(a)	6,532,025	6,342,158
Montana Power	11,494,110	11,104,805
Narragansett Electric(a)	3,485,729	2,739,660
New England G & E(c)	4,301,893	3,958,006
New England Power(a)	7,689,505	9,175,978
New Jersey P & L(a)	2,730,217	2,636,980
New Orleans P S(b)	4,566,000	4,542,000
New York State E & G	14,998,446	14,589,298
Newport Electric	266,789	229,904
Niagara Mohawk Power	31,442,000	30,383,000
Northern Indiana PS	15,477,028	13,893,971
Northern States Pwr (Minn.)	25,035,832	22,075,979
Northern States Pwr (Wisc.)	3,308,468	3,264,451
Northwestern Public Service	1,254,823	1,063,809
Ohio Edison	28,038,319	25,718,883
Ohio Power(a)	21,153,498	20,369,093
Oklahoma Gas & Electric	11,310,723	11,186,218
Orange & Rockland Utilities	3,477,928	2,909,746
Otter Tail Power	2,577,757	2,038,119
Pacific Gas & Electric	84,737,000	85,310,000
Pacific Power & Light	10,053,271	11,794,226
Pennsylvania Electric(a)	17,790,745	16,046,302
Pennsylvania Power & Light	25,272,204	22,860,758
Philadelphia Electric	42,926,261	39,265,539
Portland General Electric	6,342,425	6,494,695
Potomac Edison(a)	5,185,873	5,240,338
Potomac Electric Power	14,582,000	10,629,000
Public Service Electric & Gas	39,244,108	35,310,089
Public Service of Indiana	16,367,223	16,363,378
Public Service of N. H.	5,452,891	4,658,213
Public Service of New Mex.	3,302,361	2,855,688
Puget Sound Power & Light	7,267,213	6,424,342
Quincy Electric(a)	234,759	160,678
Rochester Gas & Electric	10,061,322	8,270,705
San Diego Gas & Electric	8,821,389	6,611,801
St. Joseph Light & Power	1,272,750	1,056,234
Savannah Electric & Power	1,665,198	1,900,755
Sierra Pacific Power	1,970,815	1,642,296
South Carolina E & G	8,092,596	8,447,915
Southern California Edison	43,394,886	40,005,407
Southern Indiana G & E	3,052,379	2,855,588
Southern Nevada Power	1,373,887	1,085,207
Southwestern Electric(a)	483,138	454,843
Southwestern Public Service	10,074,609	8,780,570
Suburban Electric(b)	825,976	828,686
Tampa Electric	5,605,004	4,750,088
Texas Electric Service(a)	17,304,079	15,903,144
Texas Power & Light(a)	14,355,096	13,710,674
Toledo Edison	7,089,000	7,129,000
Tucson Gas Electric L & P	2,932,487	2,631,510
Union Electric	23,115,000	20,476,000
United Illuminating	5,537,487	4,823,420
Utah Power & Light	9,062,375	8,565,788
Virginia Electric & Power	28,177,817	26,323,095
Washington Water Power	7,114,092	6,210,497
West Penn Power(b)	14,854,381	14,093,307
West Texas Utilities(a)	5,076,265	4,388,578
Western Light & Telephone	2,020,032	1,793,580
Western Massachusetts	4,309,510	4,035,231
Wheeling Electric(a)	796,654	798,133
Wisconsin Electric Power	17,282,423	13,106,659
Wisconsin Power & Light	8,409,820	7,397,539
Wisconsin Public Service	6,365,720	5,770,670
Worcester County Elec(b)	2,914,274	2,456,587
Total—144 companies	**$1,555,191,548**	**$1,428,456,672**

(a)—All common shares owned by a holding company.
(b)—Most common shares owned by a holding company.
(c)—Holding company controlling 4 operating companies.

***For the 12 months ended December 31, 1959 and December 31, 1958**

One substitution has been made in EW's 144-company sample. Hawaiian Electric Co. replaces Duke Power Co., whose earnings had not been reported at press time.

Pacific Gas & Electric Co once again rang up the largest net income, reporting $84.7 million for the year. But despite $48.6 million in new revenues, PG&E's 1959 net barely exceeded its 1958 figure, as costs rose generally, led by operating and maintenance expenses, which were up $26 million.

Commonwealth Edison Co turned in the second largest net income in 1959, edging ahead of Consolidated Edison Co of N.Y. Con Edison collected more revenues than any other utility—$614.9 million—but could turn this into just $68.7 million in net, for third position behind Commonwealth Ed's $72.4 million.

These Ten Companies Made Largest Net-Income Gains

Company	Percent Increase
Quincy Electric	46.1
Potomac Electric Power	39.1
San Diego Gas & Electric	33.4
Indiana & Michigan Electric	32.5
Wisconsin Electric Power	31.9
Narragansett Electric	27.2
Otter Tail Power	26.5
Southern Nevada Power	26.5
Illinois Power	24.8
Fall River Electric Light	22.0

While These Ten Showed the Greatest Declines

Company	Percent Decline
New England Power	16.2
Pacific Power & Light	14.8
Savannah Electric & Power	12.4
Green Mountain Power	7.6
Minnesota Power & Light	5.5
South Carolina E&G	4.2
Idaho Power	4.0
Lynn G&E	2.7
Portland General Electric	2.3
Appalachian Electric Power	2.0

Leading the list as the biggest percent gainer of them all came little Quincy Electric, all the way up from last place (as the biggest percentage loser) in 1958. Quincy's net went up 46%, to $234,759, thanks to a $171,000-a-year rate increase that came through on May 3rd. With a 39% net income gain, Potomac Electric Power Co earned second position, with earnings strengthened by rate increases in Maryland, Virginia, and the District of Columbia. A rate increase also helped San Diego G&E push its net up 33% in 1959. But Indiana & Michigan Electric's gain of 32% was due mostly to a $2 million increase in interest during construction.

At the opposite end of the list, New England Power Co suffered the most severe net income decline; its net was off 16%. Thus, with Quincy's big percentage gain, New England Electric System companies set the extreme limits for percent gains and declines. For NEES as a whole, though, it was a fairly good year—net income for the system rose 7.7%, near the New England regional average. Nepco attributes its decline to construction of a 150,000-kw steam station (Salem Harbor #3) resulting in a moderate over-capacity, along with unfavorable hydro conditions during the first nine months of 1959.

Windup of construction programs, with a resulting decrease of interest during construction, was the main cause of some of the biggest percentage declines. Pacific Power & Light Co's 15% net income slide was largely due to lowered interest during construction. So too, was Savannah Electric & Power Co's 12.4% decline of some $235,000 in net income (its interest during construction fell about $360,000). In fact, 1959's trend for interest during construction was down generally from the previous year. Some 76% of the 107 companies for which comprehensive earnings statements were available listed interest during construction as a credit. But the dollar total was 5.1% below that for 1958, producing a downward push on net incomes in individual companies. The effect on the overall net income totals, however, was slight.

PUSH BUTTON PEAKING PLANT FOR MAINE PUBLIC SERVICE COMPANY

Electro-Motive Power plant to supply power
for peak loads, system reserve and area protection.

For details, turn page . . . . . .

Maine Public Service Company Installs

ELECTRO-MOTIVE PEAKING AND RESERVE PLANT

Load study determines need for peaking power.

The decision by Maine Public Service Company to install Electro-Motive peaking equipment resulted from a systems study which pointed up the need for additional generating capacity to handle increased peak demands. An Electro-Motive 4200 KW plant was selected for these reasons:

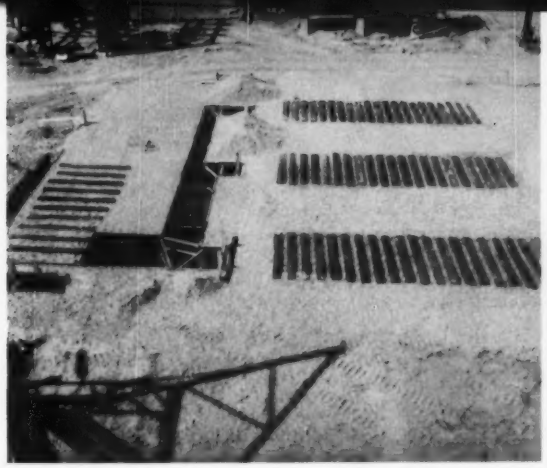
- **Low investment.** On the Maine Public Service System, the Electro-Motive plant has an annual fixed charge of less than $17 per KW per year, compared with $28 per KW per year for alternative equipment. Thus, the Electro-Motive plant provides an economical solution to short duration peak demands.

- **Unattended, remote operation.** The Maine Public Service plant is operated by push-button control from the company's central dispatching headquarters in Presque Isle, four miles from the substation where the plant is located. The plant comes on line and shuts down automatically on signal from the dispatcher.

- **Quick start.** The plant comes on line and up to full load *in 60 seconds* on quick start, or 90 seconds on a normal start. Preparation time not required for peak. Immersion oil heaters keep engines ready for instant starting. Because of this, the plant qualifies as a reliable source of power for systems reserve and area protection.

Portable components simplify installation

Each of the components in the Electro-Motive plant is contained in a sound-deadened, weather-proofed housing. This unitized, self-contained design permitted installation costs of under $17 per KW for Maine Public Service Company. (Cost included shipping, site preparation, fuel tank, material and labor for electrical connections.) How the plant was installed is demonstrated in this sequence of photos:

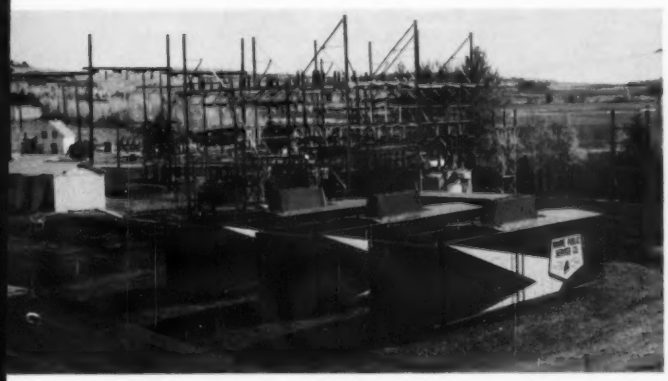


1 **Preparation of site** at the station began before plant arrived. Wood ties are set in crushed rock fill as foundation for skid-mounted components. Cable trough provides means for connecting cables and service lines. Note absence of concrete or other costly foundation work.

2 **Plant was shipped** by rail to Presque Isle from Electro-Motive Division in LaGrange, Illinois. Components are designed to ship on any standard flat car and meet standard railway clearance requirements.

3 **Truck trailers** were used to transport the components to the installation site at Flo's Inn station, four miles from Presque Isle. Components were styled in attractive green and white colors—caused favorable attention as they passed through the city.

4 **At the site,** cranes unloaded components onto the foundation ties. Engine-generator sets, balanced and vibration-free, eliminate anchoring or tie-down. Located right at the step-down substation serving the load, the plant's full capacity can be used where needed. This eliminates line loss which would occur if it were placed at the central station.



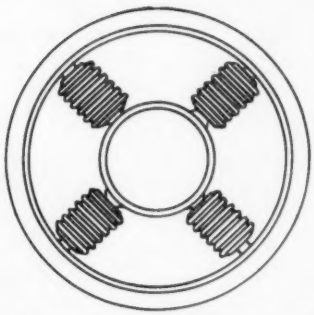
5 **Completed installation** three weeks later. The following week, after test and adjustment, the plant was qualified for commercial service for an average two hours a day. If desired, it may be moved to a new site as quickly as it was installed. A fourth generating unit may be added to boost capacity at low incremental cost.

For an analysis of the savings that can be derived from Electro-Motive peaking equipment on your system, contact your Electro-Motive representative.

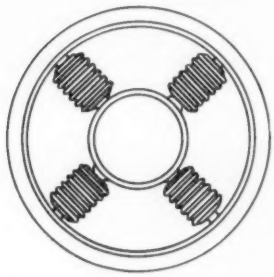
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS La Grange, Illinois

Sales-engineering offices: Chicago, New York, St. Louis, San Francisco

In Canada: General Motors Diesel Limited, London, Ontario



Standard Bus—Up to 90°C The AIEE standard, coupled with I-T-E quality construction—lowest losses.



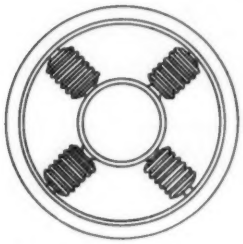
High Temperature Bus—105°C Reduces conductor size by 15% with correspondingly lower cost—but with increased losses.

Pick the bus that saves you the most

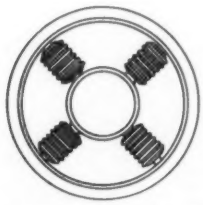
Only I-T-E Isolated Phase Bus is available in such a variety of designs to save you money. Your selection of the type of bus to buy depends on evaluation of both original cost and losses, plus careful consideration of the desired method of operation.

All I-T-E bus types are backed up by the engineering and laboratory experience of I-T-E. Design constants are so well known from theory and test that the most economical conductor to use for any ampere rating and voltage has been computer calculated.

Get full details on I-T-E Isolated Phase Bus. Write for Bulletin 2604-1A. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton Street, Philadelphia 30, Pa.



Forced-Air Cooled Bus Even smaller in size, with still lower material costs —still higher losses.



Liquid-Cooled Bus Minimum conductor size—highest losses.

I-T-E CIRCUIT BREAKER COMPANY

FUEL **Coal men are battling on two fronts:** (1) To regain their position in the eastern utility fuel markets. (2) To get Congress to hammer out a national fuels policy. On the first, there was no immediate sign of progress as Consolidated Edison and others worked toward April 1 fuel contracts. Oil and natural gas have been getting a larger share of the New York Harbor market each year since 1957, despite more favorable coal freight rates last year. It remains to be seen how the oil import quotas will affect the relative position of the three fuels this year, but the oil men used up 30% of their six-month quota during January. On the second front, a national fuels policy, an important oil group has recently decided to join with the coal men in plugging for such a policy.

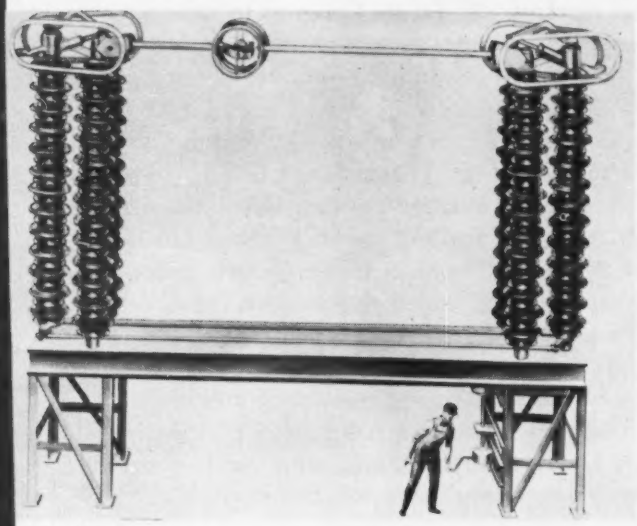
PRICES ▶ **Commodity prices were "coasting" during February** with little movement up or down, reports the National Association of Purchasing Agents in its monthly business survey. Purchasing agents generally believed that labor contracts would tend to push prices higher, but the rise would be somewhat offset by the ready supply of almost all materials.

INDICTMENTS ▶ **Manufacturing firms and individuals named in the seven anti-trust indictments** are scheduled to be arraigned Wednesday afternoon, March 16. If not-guilty pleas are entered, trials will be set for summer when the next criminal court term begins. Company answers to the civil complaints are expected around May 1. Meanwhile two grand juries in Philadelphia are continuing their three-day-a-week hearings, alternating the weeks in which they meet.

FOREIGN ▶ **Purchasing men "must adopt the over-all view** when faced with the decision to buy or not to buy abroad," said Irving Lipkowitz, director of economic affairs, Reynolds Metals Co. He told P. A.'s at a New York meeting, "The purchasing executive, as a policy-making member of top management, must begin to accept his responsibility, which goes beyond the interests of his company to include his industry and his country."

SERVICES ▶ **Miniaturized A-C network analyzers are available on lease basis,** General Electric Co announced recently. Monthly rental will be approximately $180. The device is used for analyzing transmission problems and for calculating power-system design. It was developed to aid engineers in solving day-to-day problems too large for manual calculations, but too small to justify time and expense of using large installations. Utilities, cooperatives, consultants are among potential users.

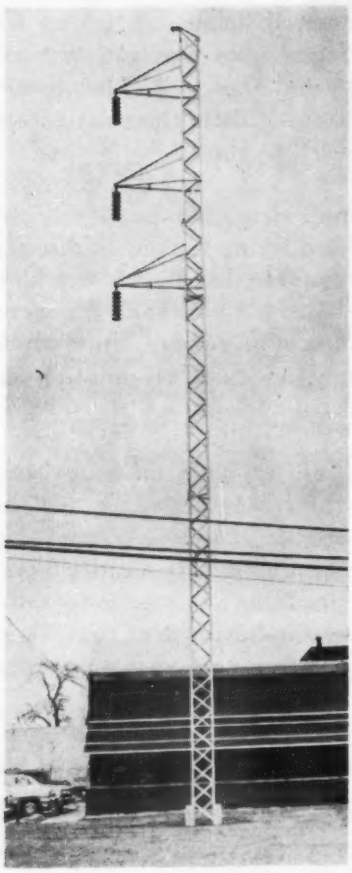
News of Manufacturers ..... page 102
New Equipment ..... page 105
Readers Service ..... page 106



EHV Switches Are Designed

General Electric is building a 690-kv, 1600-amp disconnect switch with impulse rating of 2300 kv (artist's concept at left) for its own EHV project in Massachusetts. This will be the highest-rated switch GE has produced. First utility order for disconnect switches has been received by the company: it will supply two disconnect switches, similar to the GE-designed 345-kv, but rated 460 kv, 1600 amp, for Pennsylvania Electric Co's 12-mile experimental line. These will be installed at the Claysburg and Saxton stations.

All three switches feature dual motion, vertical-break, opening and closing.



Pole Withstands 140-Mph Wind Test

Ability of Alrectic aluminum lattice pole (left) to withstand hurricane forces was demonstrated (above) during recent tests before 40 utility and consulting engineers. Prototype model was designed, fabricated and tested by Handley-Brown Co for use on a Louisiana Power & Light 69-kv line through congested areas. Line Material Industries will handle distribution.

Weights totaling 6345 lb were suspended from the crossarms and at other points to simulate wind loading up to a maximum of 140 mph, 12% greater than NEMA standards. Dead weight of tower and conductors was also simulated.

The weight of the 85-ft-long pole, 2 ft sq, with three 7-ft crossarms was reduced to 1400 lb, about 20% the weight of an equivalent steel pole, by using specially designed aluminum extrusion shapes for main structural members. These were made by Olin Mathieson Chemical.

Tax Law Change Cited To Increase Basic Research

Need to change tax laws to encourage industry to provide greater support for basic research was urged by Westinghouse Electric Co's chief executive officer, Mark W. Cresap Jr. In a speech at the Economic Club of Detroit on February 29, he said this step must be taken to help America meet the challenge of the Soviet Union which proclaims its determination to lead us in science and technology.

Our overall-research program has no equal, he said, but greater emphasis must be placed on basic research.

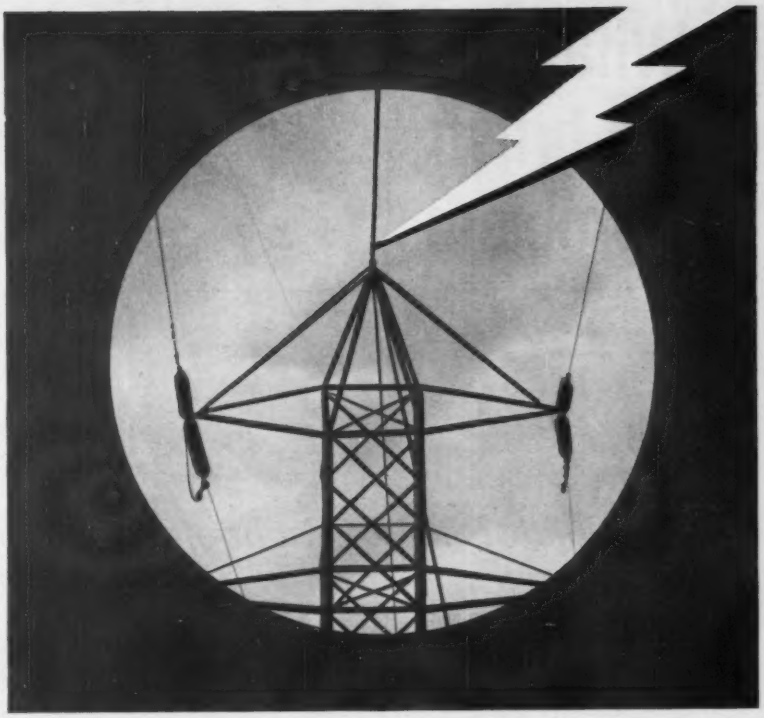
Tax Incentives

With the government already paying for almost 50% of the total national basic research, additional funds must come primarily from the American industry, and the government must give industry an incentive to increase progressively its support, he pointed out.

"The National Science Foundation has recommended that serious consideration be given to the use of tax incentives for this purpose. One of the political parties has formally called for government to encourage increased support" for this. Suggested incentives have included faster write-off of new research facilities, outright tax credits for research contributions or expenditures and income tax write-offs for expenditures on research facilities.

He called attention to the Curtis Bill (HR 4797) now before Congress, which would permit a business or individual taxpayer to take an income tax credit (deduction from the actual tax bill, rather than from the taxable income) for contributions for basic research work performed by colleges, universities and other non-profit research organizations. This would be limited to a deduction of 90% of the contribution and could not exceed 5% of the total tax bill.

This method of research support would be more effective than direct grants by the government, Cresap thinks, because attrition and administrative expenses which are indigenous to industry's grants to laboratories, which pass through Washington, would be avoided. Grants would have no strings at-



You're on the Safe Side with

CF&I Galvanized Steel Strand

Galvanized Steel Strand is a proven material for grounding power transmission lines. The wire used in CF&I Steel Strand is subjected to rigid quality controls for overhead ground wire and is carefully galvanized, assuring long-lasting protection against corrosive elements.

CF&I Galvanized Strand is made in accordance with ASTM Specification A-363, in seven- or three-wire constructions. For guy, messenger and other applications, CF&I strand is made to ASTM Specification A-122. CF&I is also equipped to manufacture strand to our customers' own specifications.

For quick delivery, see your local electrical distributor or contact the nearest CF&I office.

7515

CF&I STEEL

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

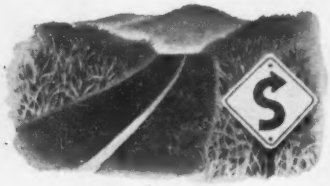
In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings Boise • Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston • Kansas City Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • San Leandro • Seattle • Spokane • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

Whatever your brush problem

Line?



Roadside?

Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name_____ Title_____

Company_____

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City_____ Zone____ State_____

AMCHEM

WEEDONE

BRUSH KILLERS

another chemical development of
Amchem Products, Inc.
(Formerly American Chemical Paint Co.)
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tached, coming from many sources.

For basic research work performed in its own laboratories, a business taxpayer, under provisions of the Curtis Bill, would be credited for 75% of the amount spent. Credit could not exceed 3% of the total tax bill.

Combustion to Build Boiler For Will County Station

Combustion Engineering will build a 3,900,000-lb-per-hr boiler for Commonwealth Edison's Will County station to serve a 510-Mw turbine generator. It will be the first unit of this capacity purchased by a private utility, says the manufacturer. Shipment is scheduled to start in July 1961.

The C-E Controlled Circulation Boiler will be the radiant reheat, twin-furnace, pressure-fired type. It will generate steam at 2,500 psi, 1,000F. At full capacity, it will consume 4½ 50-ton carloads of coal per hour. Coal will be prepared by firing by eight Combustion Engineering bowl mills, each capable of grinding 34 tons per hour.

GE Develops Control System For Medium Steam T-Gs

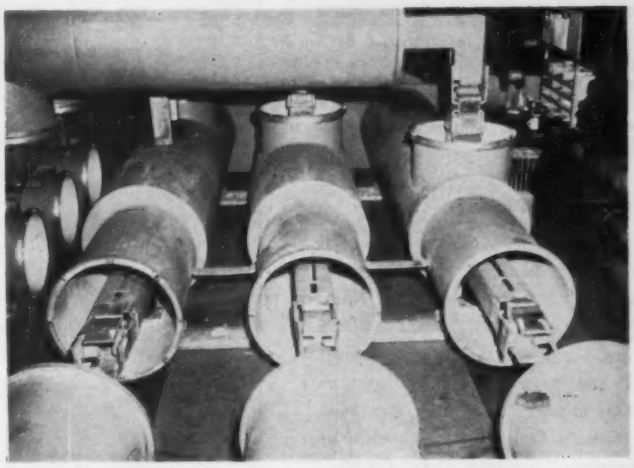
A new electro-hydraulic control system "ten times faster and four times more sensitive than present mechanical controls" has been announced for General Electric's medium capacity steam turbine-generators. The company regards the development as a major step toward power system automation.

First application of the controls will be on units for industrial manufacturing facilities requiring power generation and process steam. The new system eliminates many parts, making installation and maintenance easier and reducing operating costs, attaining faster, more sensitive frequency and process pressure control.

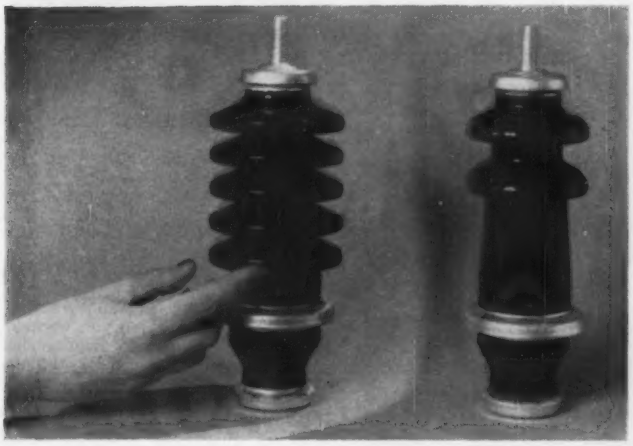
A tachometer generator, pressure transducer and a solid state analog computer which directs hydraulic valve positioning devices make up the system. The first industrial installation is in regular use on a 12,500-kw single automatic extraction condensing unit with 600 psig inlet pressure and 200 psig extraction pressure.

(For further information refer to Readers Service on page 106)

Isolated-Phase Bus . . .



. . . reduces circulating currents. Designed for generating station service, the bus duct is arranged so longitudinal currents will circulate in the conductor enclosure at all times. The circulation minimizes induced current problems which occur in structural members parallel to the 3-phase bus duct plane. The bus has field-welded enclosures, reduces voltage build-ups between enclosures and ground, and has a single-insulator conductor support.
General Electric Co, Schenectady 5, N. Y.

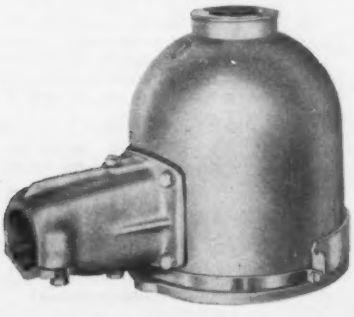


Capacitor Bushings . . .

. . . for high-voltage applications have increased creepage distance over exterior surface. The increase is gained by altering the contour and shape of the skirts. Bushing height is not changed, permitting interchanging of capacitor units using new or old bushings. The bushings are standard on all new 50 and 100-kvar ratings in the 5, 8.7, and 15-kv classes.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Luminaire Heads . . .

. . . have adjustable latch lugs which provide for 60-deg rotation of the optical assembly in either direction. Useful at intersections, this permits street light pattern orientation regardless of the pipe bracket's position with respect to the street axis. Feature is available on standard slipfitter and photoelectric heads.
Joslyn Mfg & Supply Co, 155 N Wacker Dr, Chicago 6, Ill.



Synthetic Rope . . .

. . . for pulling in electrical conductors on transmission and distribution lines has improved dielectric features. The rope (Pengo-Prope) is waterproof, light and strong, and satisfactory for tension stringing.

Petersen Engineering Co, Inc, 460 Kifer Road, Santa Clara, Calif.

(*More New Products on p* 106)

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

GE.....Isolated-Phase Bus ☐
Westinghouse .....Bushing ☐
Joslyn .....Luminaire Head ☐
Petersen .....Synthetic Rope ☐
Line Material.....Clevises ☐
Glastic .....Insulators ☐
Bodendieck .....Hot Stick ☐
Standard Transformer..Transformer ☐
Arps.....Heavy-Duty Trencher ☐
Opad.....Sequence Indicator ☐
Ceramaseal .....Bushing ☐
Associated Research.....Test Set ☐

OTHER

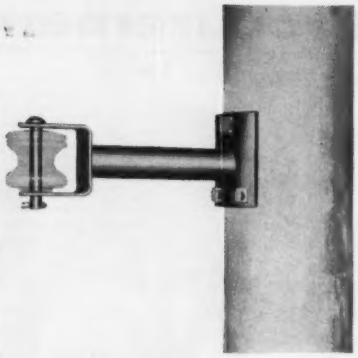
Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countires or to competitive manufacturers.

NAME _____
TITLE _____
DEPT. _____
COMPANY _____
ADDRESS _____

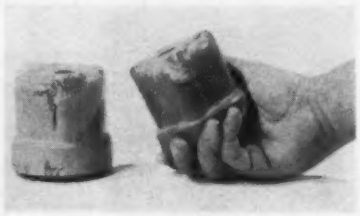
FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

MARCH 14, 1960



Extension Clevises . . .

. . . provide greater clearance between secondary conductors and other equipment, affording additional climbing space. Outstanding features are rigid, one-piece construction, high strength, and large pole-bearing surface.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.



Molded Insulators . . .

. . . with high track resistance are made of fiberglass alumina-polyester. Parts molded of the compound, called Resistrac, resist carbon track formation when operating under voltage stresses in extremely humid and contaminated conditions. The compound is flame resistant.
Glastic Corp, 4321 Glenridge Rd, Cleveland 21, Ohio.

Hot Jumper Hold Stick . . .

. . . is useful for hot-line splicing or making up new dead ends and in the cutting of a conductor prior to installing a sleeve splice. Flush sides of the jaws act as guide for hot hacksaw cutting operation. The handle and inner stick are made of fiberglass which was tested at 100 kv per ft. Main jaw is solid with the

Crapo
GALVANIZED STEEL STRAND HAS ALL **5**

1. *Strength*
2. *Workability*
3. *Ruggedness*
4. *Long Life*
5. *Economy*

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!

INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana

handle. The sticks are available in three sizes, from 4 to 6 ft, with various jaw capacities.
Bodendieck Tool Co, Rt 48 N, Taylorville, Ill.

Dry-Type Transformer . . .

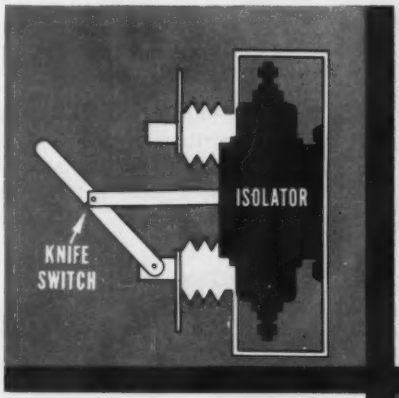
. . . for commercial and industrial service has low sound levels and light-weight, small-size construction. Single and 3-phase units in ratings through 15 kva and 600 v are designed with core and coil assemblies in weatherproof steel cases filled with the company's new ERS compound. Wound core construction results in low losses and improved regulation.
Standard Transformer Co, Warren, Ohio.

Heavy-Duty Trencher . . .

. . . for one-man operation has improved portability. Weighing 1,080 lb, the unit (Model MA-2 Trench Devil) can be skid-loaded on trucks or transported short distances at 3

(*Continued on page* 108)

ISOLATORS
are the most practical disconnect you can buy!

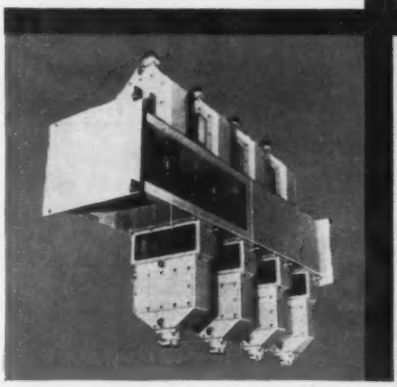


Isolators require the least space of any disconnect

. . . only ⅓ as much as an equally rated knife switch. ISOLATORS save on cubicle construction, floor space and installation time . . . lightweight, easy to install—come complete with all elements assembled in rigid frame.

Isolators are safe!

. . . the straight line action includes fool-proof protection. The insulating sleeve shields the live parts at all times and still shows a clearly visible gap when the switch is open.



Isolators are versatile!

. . . so compact, practical for switching centers that we've given a new name to a combination of bus duct and disconnect . . . the ISO-DUCT. Neat and handsome, excellent for both modern plants and replacements, ISOLATORS can be combined with potheads for any arrangement.

Available from 5KV to 15KV in ratings from 600 to 2000 amp.

3E's famous straight-line disconnect is still unmatched in all important features!

THREE E COMPANY
Melrose Park, Illinois
A DIVISION OF HUBBARD AND COMPANY

3E

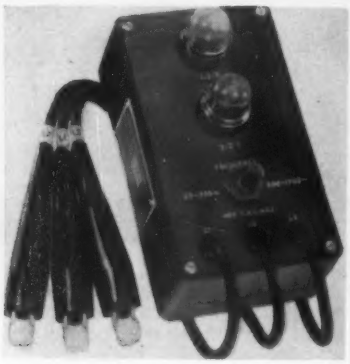
For full details ask for Bulletin 140

Representatives in Principal Cities

Heavy-Duty Trencher . . .

(*Continued from page* 107)

mph under its own power. Digging widths vary from 2¾ to 8 in., up to 54 in. deep. Mechanical drive permits quick reversal of direction while digging, for digging vertically along a wall.
Arps Corp, New Holstein, Wis.



Sequence Indicator . . .

. . . for multiphase power supply determines order in which voltage peaks occur. The low-cost unit (Model VA2) is designed for direct connection to polyphase circuits with voltages between 104 and 480 v. The frequency range of the 24-oz instrument is 30 to 1,000 cps.
Opad Electric Co, 43 Walker St, New York 13, N. Y.

Sealed Bushings . . .

. . . for high reliability capacitors and electronic and distribution transformers have metal parts bonded directly to the porcelain. The seal's alloy has a melting point above 300C, enabling use of the terminals in high temperature electrical equipment. The units are available in sizes of 2 to 20 in.
Ceramaseal, Inc, New Lebanon Center, N. Y.

Test Set . . .

. . . with outputs to 30 kv determines dielectric strength in motors, generators, cables, and switchgear. The bench-type, semi-portable unit indicates output voltage and insula-

tion leakage on separate meters. All models, with ac or dc output, provide variable voltage control.
Associated Research, Inc, 3777 W Belmont Ave, Chicago 18, Ill.

More New Products

Portable **power distribution system** provides temporary power for tools. The waterproof 3-pole system consists of Dynaprene SO cords molded to heavy-duty neoprene connectors. —Tuffline Div, Whitney Blake Co, New Haven 14, Conn.

U-cable guards protect power or telephone cables at ground entrance. The guards accommodate cables ranging through 3½ in. dia.—Line Material Industries, McGraw Edison Co, Milwaukee 1, Wis.

Low-price **ultrasonic cleaner,** the diSONtegrator System Forty, has ½-gal capacity. It operates on a 40-w generator with an output of 90,000 cps.—Ultrasonic Industries, Inc, 141 Albertson Ave, Albertson, N. Y.

Close-coupled **pump motors** are furnished in NEMA rerated frame sizes 182 through 405U. Sizes range from ½ hp at 900 rpm through 75 hp at 1,800 rpm. with explosion-proof and totally-enclosed fan-cooled from ½ hp, 900 rpm through 30 hp.—Lima Electric Motor Co, Inc, Lima, Ohio.

Low-cost **system** measures frequencies of mobile radio transmitters. Called the PPM Package, the device tests to the FCC split-channel tolerance of 0.0005% (above 50 mc).—Lampkin Laboratories, Inc, Bradenton, Fla.

Thermal overload relay (Type 194A) has been redesigned for use in size six and larger starters. The relay, with direct mounted heater, compensates for temperature differences to eliminate motor stoppages.—Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Dual-Voltage Transformer

(*Continued from page* 74)

saving favors conventional 7.2-kv transformer use. Immediate-conversion areas require either removing the 2.4-kv transformer and replacing it with a dual-voltage transformer until cutover day, or installing a 7.2-kv transformer on the pole with the 2.4-kv transformer until cutover, later removing the 2.4-kv unit. Item 1 shows the total cost using conventional transformers; Item 3 the saving favoring conventional units.

The saving through conventional-transformer use for areas to be converted immediately is only a small percentage of total cost. As in the case of the saving due to dual-voltage transformer use in areas for later conversion, SCE&G looks on these as "break-even" costs. In areas where customers are being served, dual-voltage transformer use makes conversion so much easier that it more than offsets the very small extra cost.

The dual-voltage transformer policy of SCE&G eliminates conversion methods that endanger customer relations and lost revenue on cutover day. If these factors could be measured in dollars and cents, no doubt dual-voltage transformer use would pay off in every instance.

Quartz Lamps 'Summer-ize' Winter Shoppers

The use of quartz infrared heat lamps is encouraging shoppers to step right up and enjoy balmy weather in winter at a department store on Chicago's State Street.

The quartz lamps drop a curtain of warmth on window shoppers standing within six ft of windows at Carson Pirie Scott & Co. It is reportedly the country's first permanent outdoor installation of quartz lamps designed to take the chill off winter window shoppers.

As shown in the photo, shoppers can open their coats and still be warm.

In opening ceremonies, the store conducted a "Carribbean Cruisewear" fashion show, including models in bathing suits, right on the sidewalk in front of a display window.

Commonwealth Edison Co tied in with a full-page newspaper ad which said, "Now at Carson Pirie Scott & Co another modern miracle of electric heat. A curtain of warmth for window shoppers." Ad also pointed out that even if it is zero degrees outside shoppers feel a penetrating warmth that keeps them comfortable without overheating. The utility also invited shoppers to stop by the company offices and inspect its Electric Heating Exhibit to find out how electric heating can be applied in the home.

Electric Range Shipments May Reach 1.75 Million

Electric range factory shipments will reach 1,750,000 units in 1960 according to forecasts made by the electric range section of the National Electrical Manufacturers Assn. This goal is based mainly on the highly successful year 1959 was for sales of electric ranges.

In 1959, shipments of free-standing electric ranges hit 930,000 units, a 14.8% increase over 1958. Shipments of built-in reached 750,000 units, or a gain of 37.8% over '58.

NEMA also reports that the gap between sales of gas and sales of electric ranges is rapidly closing and the one-to-one sales ratio will soon be here.

Evidence of this is the fact that the ratio of gas to electric range factory shipments for 1959 was only 1.24-1. This compares with a 1.40-1 ratio for 1958, and 1.46-1 in 1957.

In free-standing models, which represents over 70% of all ranges sold, the ratio of gas to electric in 1959 was 1.85-1, a gain over the 2.06-1 registered in '58. Built-in electric ranges held a 2.08-1 advantage over gas in '59. This, however, was down from 2.35-1 in '58.

Promotional tools offered to utilities to stimulate electric range sales in 1960 include a three-color display streamer, six-page brochure listing the many advantages of electric cooking, and a 16-page tabloid-size newspaper supplement. Mats and photo kits are also available.

For further information write: Ralf Shockey & Associates, Rm 6111, 250 Fifth Ave, New York 1, N. Y.

Southern California Again Leads Nation in GMH Sales

Southern California Edison Co has again led the nation in sales of Gold Medallion Homes. Awards of Gold Medallions for all-electric excellence to home and apartment builders rose 331% over 1958 figures, when SoCalEd also led the nation.

More than 70% of the total Gold Medallions were awarded to apartments or multiple units. Custom-built homes and tract homes filled the remainder.

Bronze Medallions also hit a record high during the past year in the utility's service area.

Keep Pace Electrically Booklet Offered

An illustrated planning guide describing "Keep Pace Electrically," the new electrical industry program aimed at the commercial market (EW, Jan. 11, 1960, p 76), has been issued by the National Wiring Bureau.

A complimentary copy of the booklet, "A New Sales Approach to the Commercial Market" (PB-104), is available from the commercial promotion department, NWB, 155 E 44th Street, New York 17. Additional copies: 25¢ ea, plus forwarding charges.

Heller Elected VP of Duquesne Light

R. W. Heller (photo) has been elected vice president of Duquesne Light Co, succeeding George W. Ousler who has retired.

In his new capacity, Heller will be responsible for all activities of the utility's Sales Division.

From 1922 to 1924, Heller was employed by Westinghouse Electric Corp in the central engineering department at East Pittsburgh. He then joined Duquesne Light as a power sales engineer, later serving as supervisor of industrial sales and director of industrial sales. In 1950, he became manager of residential sales.

Ousler has become assistant to the president of Edwin L. Wiegand Co, coordinating the firm's electric heating program with those of electric utilities throughout the country. He succeeds Pressly H. McCance who recently became director of The Buhl Foundation.

Monongahela Power Names Two New Vice Presidents

Two new vice presidents have been elected to the administrative staff of Monongahela Power Co. They are G. Ellis Vest and J. Duane Gorman. Vest will be responsible for coordination of division activities, and Gorman will be in charge of promotion and sales.

Vest succeeds Vice President P. H. Sommer who retired February 1 after 37 years of service. Sommer had been with the company for 37 years.

Both Vest and Gorman have been with Monongahela Power since 1937 and for the past several months have been associated with the company's executive staff in its general offices in Fairmont, W. Va.

VEST GORMAN

Stone & Webster Elects Executive VP, Two New VPs

Stone & Webster Service Corp has elected L. S. Storrs Jr, executive vice president, and Earl J. McConnell and George L. Schofield, vice presidents.

Storrs, who joined Stone & Webster in 1933, was elected a vice president in 1954 and a director in March, 1959. He is in charge of the Service Corp's special assignments for public utilities and general industry.

McConnell joined the firm in 1947 as a senior gas engineer and became head of the gas department in 1951. He came to the company's New York office from Oklahoma Natural Gas Co where he was chief engineer.

Schofield is an operating sponsor for several of the corporation's gas utility clients and will continue in that capacity. He came to Stone & Webster in 1946 from Fall River Gas Co where he was assistant superintendent of production and chief chemist. Before that he was with Blackstone Valley Gas & Electric Co as chief chemist.

STORRS McCONNELL SCHOFIELD

Commonwealth Associates Names Chief Engineer

Carl E. Asbury (photo) has been appointed chief electrical engineer of Commonwealth Associates, Inc. He was formerly supervisor of Commonwealth's electrical application section. Asbury has been with the organization since 1946, and before that was with Illinois Power Co.

He is a member of several American Institute of Electrical Engineers technical committees and ASA groups.

M. C. Westrate has been appointed chief systems engineer, and J. A. Elzi, coordination engineer.

Mullen Promoted to Manager of Production

Robert M. Mullen has been promoted to manager of production for Eastern Shore Public Service.

Mullen came to Eastern Shore in 1946 as assistant manager of production. For 13 years he served as senior engineer and mechanical engineer of the system development department at Duquesne Light Co.

(*More News About People, p* 112)

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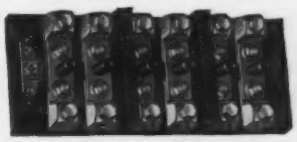

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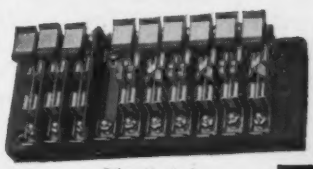

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Sargent & Lundy Names Four to New Posts

Sargent & Lundy, consulting engineers, has made the following appointments: Henry C. Schroeder named chief engineer; Harry H. McMeen made chief mechanical engineer; and John J. Walsh named a Partner. At the same time, Robert W. Patterson was appointed to the position of Associate.

SCHROEDER McMEEN WALSH

Schroeder who succeeds Andrew R. LeBailly, retired, has been with Sargent & Lundy since 1936 and has been a Partner since 1948. McMeen, who succeeds Schroeder has been a Partner since 1951 and has been with the firm for over 21 years. Walsh began with the company in 1947 and was appointed an Associate in 1956. He is a mechanical engineer with the firm.

LeBailly was with the consultants for 32 years and had served as chief engineer since 1954.

PERSONAL BRIEFS

Leslie Silverman, professor of engineering in environmental hygiene, and director of the radiological hygiene program of the Harvard University School of Public Health, has been elected chairman of the Atomic Energy Commission's Advisory Committee on Reactor Safeguards. He will serve a one-year term.

W. E. Parfitt, formerly vice president of Blaw-Knox Co, has joined Gibbs & Hill, Inc, consulting engineers, as general representative.

Stephen F. Dunn has been elected president of the National Coal Assn. He is the first paid president in the 42-year history of the organization. Dunn has made the following appointments: **Tom Pickett,** vice president in charge of government relations department; **W. W. Bayfield,** vice president in charge of the marketing department; **Thomas Howarth,** secretary and assistant treasurer, who will also be director of the fiscal management department. **Carroll F. Hardy** continues as managing director of the Bituminous Coal Institute, which becomes a part of the marketing department.

New officers of the Inland Empire Electrical League are: **Clarence Pierce,** president; **A. E. Brown,** vice president; **H. O. Colburn,** treasurer; and **George Gough,** secretary and managing director. Pierce and Colburn were re-elected. Section chairmen are: **Bill Stout,** appliance section; **Herbert A. Whitney,** supply and apparatus section; **Clarence Hurd,** farm section; and **Blair Plowman,** lighting section.

R. T. Patterson Co, Inc, has opened offices at 350 Grant Building, Pittsburgh, Pa., specializing in the field of consultation, engineering management, and construction of industrial, utility and steel enterprises. Principal of the firm is **R. T. Patterson,** formerly president of Patterson-Emerson-Comstock, Inc.

Timothy J. Noonan has been elected president of the New England Electric Institute, Inc. He is New England district manager of Hotpoint. **Dale E. Washburn** was elected vice president; **Ralph E. Deloid,** treasurer; **J. A. Galvin,** secretary; and **Samuel Gronich,** assistant secretary.

Gail K. Pinkstaff has been elected executive vice president and managing director of the National Appliance & Radio-TV Dealers Assn. He succeeds **A. W. Bernsohn.** Pinkstaff has been director of member services of the Master Photo Dealers and Finishers Assn.

F. Laurence Chandler has been elected secretary-treasurer of Anaconda Sales Co, a wholly owned subsidiary of the Anaconda Co.

Dr Robert J. Wiseman has retired as vice president and chief engineer of the Okonite Co.

Cornell-Dubilier Electric Corp has made the following promotions: **Robert J. Reigel** to merchandising sales director; **Arthur Williams** to commercial products sales director; and **Glenn M. Ronk** to military and industrial sales director.

Eddystone Division, Baldwin-Lima-Hamilton Corp's **Ray S. Quick** has retired.

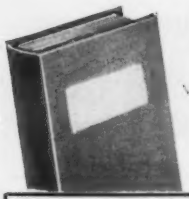
Carl A. Schlegel, a vice president and member of the board of directors of United Engineers & Constructors, Inc, has retired.

Charles F. Ramsdell has been appointed eastern regional sales manager of the Utility Division of Highway Trailer Co.

Sel-Rex-Corp has appointed **Peter Arnold** eastern sales manager for equipment for its subsidiary, the Meaker Co.

J. S. Urbanik has been given new responsibilities for managing the Kaiser Aluminum & Chemical Corp's Wire and Cable Works at Bristol, R. I. He will continue to serve as division manager of plant operations.

Richard F. Brackin, Yale Materials Handling Division, Yale & Towne



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Manufacturing Co, has been promoted to assistant director of engineering.

William E. Sprackling, who retired as president of Anaconda Wire & Cable Co at the end of last year, has been engaged by the Anaconda Co as a special representative.

General Electric Co has made the following appointments: **Charles B. Vaughn,** manager-marketing of the insulator department; **Dr John G. Hutton,** general manager of the specialty control department; **Robert D. Ahles,** manager-marketing of the Schenectady Foundries; **Herman L. Weiss,** general manager of the Lamp Division; **Dr Sumio Yukawa,** supervisor-applied metallurgical research, materials and processes laboratory, and **John E. Phillips,** manager-product development laboratory of the large steam turbine-generator department; **Leonard H. Slaughter,** manager of the data processing center, communication products department; **Hughes W. Ogilvie,** manager of marketing, medium steam turbine, generator and gear department; **Harry W. Lawson,** manager-user industries sales for the central district of the Apparatus Sales Division; **Peter G. Smee,** manager of microwave systems design and **Elmer W. Hassel,** manager of tone-signalling and filter design engineering, for the communications products department; **Philip R. Milroy,** manager of engineering at the outdoor lighting department. Three appointments in the GE computer department have been made. They are: **Kenneth R. Geiser,** manager of the department's newly organized business-planning operation; **Dr Robert Johnson,** manager of engineering; and **Dr Helmut M. Sassenfeld,** manager of the newly formed applications section.

Jack Whitener, president and owner of Southwest Electric Co, has become a member of the board of directors of the National Electrical Contractors Assn.

E. D. Shiffler, district manager, Major Appliance Division, General Electric Co, has succeeded **R. K. Zimmerman,** vice president of Kansas City Power & Light Co, as president of the Electric Assn of Kansas City.

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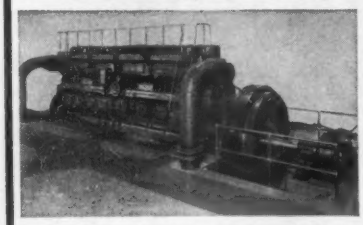

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DEPARTMENT OF THE INTERIOR. Bureau of Reclamation. Sealed bids (Invitation No. DS-5287) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, April 12, 1960, for furnishing one 230-kv and one 115-kv, 5,000,000-kva, 1,200-ampere, 3-cycle interrupting power circuit breakers for Jamestown Substation, Missouri River Basin Project, North Dakota. Delivery is desired within 390 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 25, Colorado. Floyd E. Dominy, Commissioner.

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The Meetings Calendar

MARCH

Rocky Mountain Electrical League—Electric Meter Institute, Engineering Department, Denver University, Denver, March 20-25.

Wood Pole Conference—Oregon State College Campus, Corvallis, March 21-22.

Southeastern Electric Exchange—Annual Conference, Boca Raton Hotel & Club, Boca Raton, Fla., March 21-23; Directors Meeting, Boca Raton Hotel & Club, Boca Raton, Fla., March 23.

National Electrical Manufacturers Association — First National Electric House Heating Exposition, Sherman Hotel, Chicago, March 21-23.

Canadian Electrical Association—Western Zone, MacDonald Hotel, Edmonton, Alberta, March 21-23.

Institute of Radio Engineers—National Convention, Coliseum & Waldorf-Astoria Hotel, New York City, March 21-24.

Electrical Industry Show & Lighting Exposition—Sponsored by Electrical Maintenance Engineers Association of Southern California, Shrine Exposition Hall, Los Angeles, March 23-26.

Pennsylvania Electric Association—Personnel Practices, Philadelphia, March 24.

Oklahoma Utilities Association—Accounting Section, Biltmore Hotel, Oklahoma City, March 23; Association Convention, Biltmore Hotel, Oklahoma City, March 24-25.

Tennessee Valley Public Power Association—Annual Meeting, Andrew Johnson Hotel, Knoxville, March 28-29.

American Power Conference—22nd Annual Meeting, Sherman Hotel, Chicago, March 29-31.

Edison Electric Institute—Area Development Committee, Atlantic City, March 31.

Pacific Coast Electrical Association—Engineers & Operating Meeting, Hotel Claremont, Berkeley, California, March 31-April 1.

APRIL

Maryland Utilities Association—Spring Business Meeting, Lord Baltimore Hotel, Baltimore, April 1.

Sixth Nuclear Congress—New York Coliseum, New York City, April 3-8.

American Institute of Electrical Engineers—Southwest District Meeting, Houston, April 4-6; Conference on Electrification of Materials Handling Equipment, Hotel Sheraton, Philadelphia, April 12-13; East Central District Meeting, Charleston, W. Va., April 12-14; Joint Automatic Techniques Conference, Sheraton-Cleveland Hotel, Cleveland, April 18-19; Great Lakes District Meeting, Milwaukee, April 27-29.

• **Edison Electric Institute**—Sales Conference, Edgewater Beach Hotel, Chicago, April 4-6; Power Survey Committee Meeting, EEI, New York City, April 7-8; Industrial Relations Committee joint with New England Regional Utility Group, Somerset Hotel, Boston, April 21-22; Accident Prevention Committee, April 24-27; EEI-AGA National Conference of Electric & Gas Utility Accountants, Commodore & Roosevelt Hotels, New York City, April 25-27; Statistical Committee, New Orleans, April 28-29.

• **Northwest Public Power Association**—Annual Meeting, Eugene Hotel, Eugene, Ore., April 6-8.

• **Southeastern Electric Exchange**—Engineering & Operation Section Conference, Roosevelt Hotel, New Orleans, April 7-8.

• **ASME-SAM Management Engineering Conference**—Statler Hilton Hotel, New York City, April 7-8.

• **Pennsylvania Electric Association**—Land & Land Rights Committee, Greensburg, April 7-8; Residential Committee, Altoona, April 11-12; Communications Committee, April 21-22; Systems Operation Committee, Bedford Springs, April 28-29.

• **Pacific Coast Electrical Association**—Administrative Services Section, Huntington-Sheraton Hotel, Pasadena, April 11-12.

• Additions this week.

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